TECHNOLOGY DEPT.

AMERICAN MACHINIST

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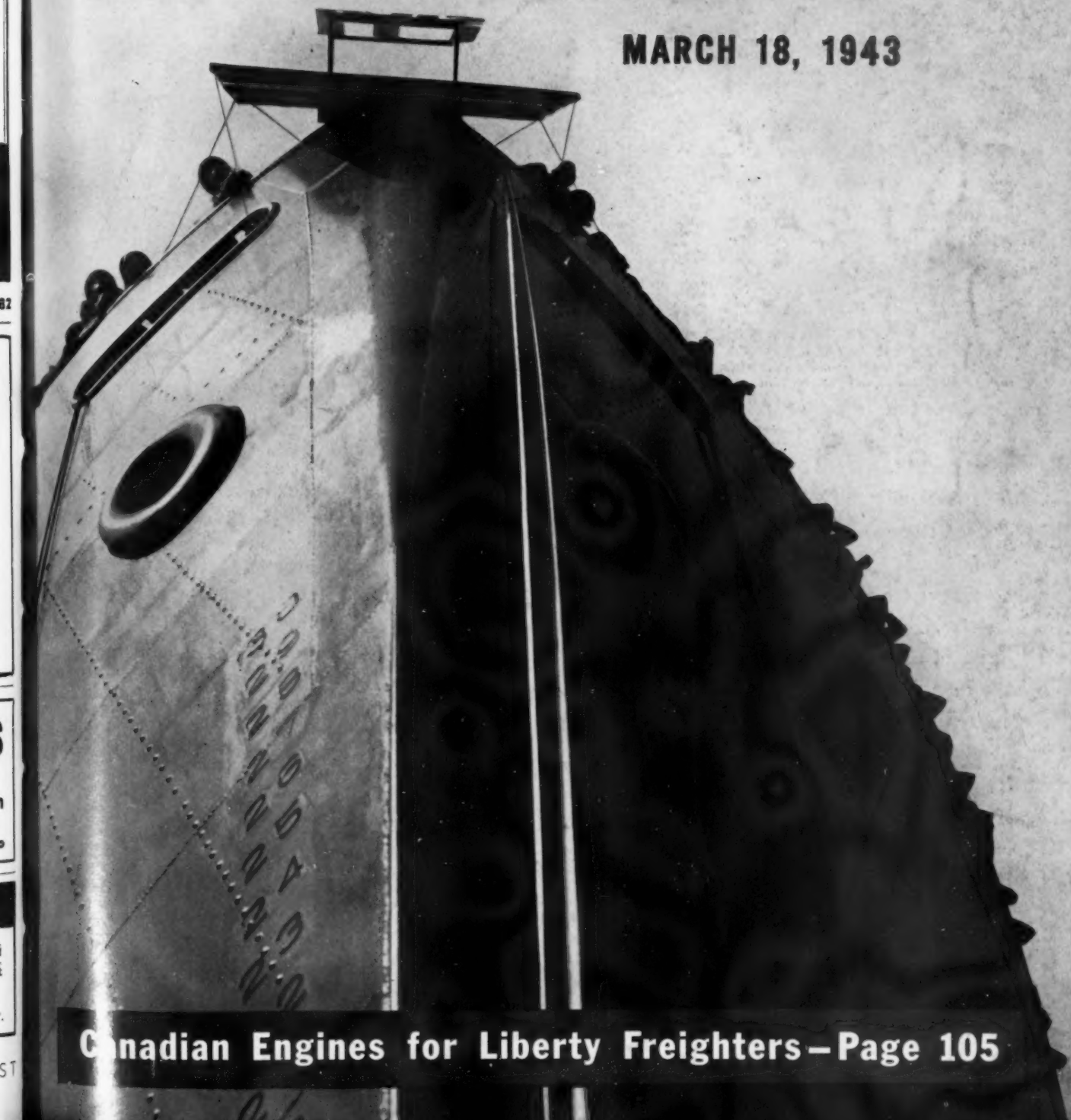


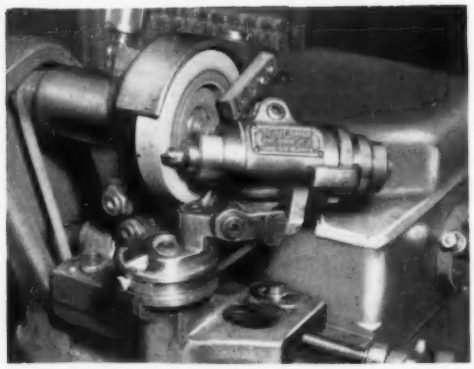
Canadian Engines for Liberty Freighters—Page 105

TO GET MAXIMUM TOOL LIFE

PLUS PRODUCTION -- ACCURACY -- FINISH

FROM YOUR BORE-MATIC TOOLS

GRIND TOOLS THIS WAY

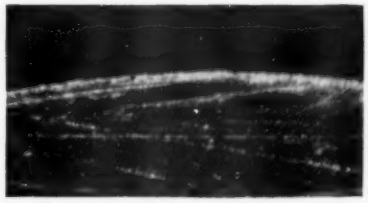


Your single point carbide tools can be quickly lapped exactly to required specifications on the Heald Tool Sharpener — make a few simple adjustments, flick a switch and your tool is correctly lapped, automatically.

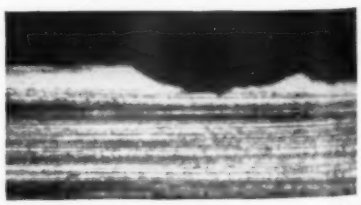
NOT THIS WAY

The personal element is bound to be reflected in tools ground free hand. Exact tool shapes are impossible to produce. Undesirable irregularities in the cutting edge cannot be avoided.

Free hand grinding of single-point cemented carbide tools will cut short tool life — and lower production, too. By correctly lapping carbide tools on the Heald Tool Sharpener tool life can be greatly increased since a lapped edge is keener, cuts longer, doesn't break down as fast as a ground edge . . . valuable tool material is conserved because more pieces are produced per sharpening, less material is lost in sharpening . . . better accuracy and finish are obtained as a result of the lapped edge cutting more smoothly, holding its contour longer . . . production is boosted because time lost in resharpening and replacing tools is measurably reduced. Such results cannot be obtained by grinding tools free hand — they must be mechanically lapped on a diamond wheel. Only by positively controlled diamond lapping can absolute regularity of cutting edge and exact nose radii, rake, shear and clearance angles be consistently reproduced. The Heald Tool Sharpener is designed to sharpen tools this way — quickly and inexpensively. Complete details gladly sent on request.

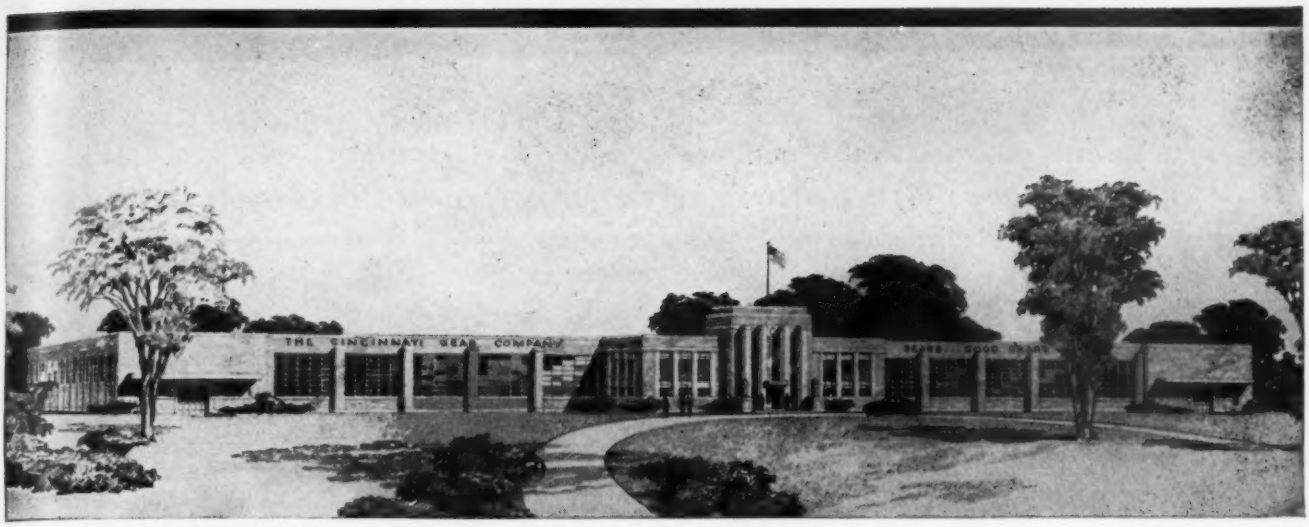


Photomicrograph of tool point lapped with fine grit diamond wheel on Heald Tool Sharpener. Magnification 100X. Note the absolute regularity of cutting edge. This means longer tool life, better finish and accuracy, increased production.



Photomicrograph of tool point ground free hand with fine abrasive wheel. Magnification 100X. Irregularities in cutting edge result in localized stress concentration, then breakdown of the cutting edge and rapid wear.

THE HEALD MACHINE CO. WORCESTER MASS. U. S. A.



CINCINNATI GEAR EXPANDS

To produce more gears
• for more equipment
• for more fronts

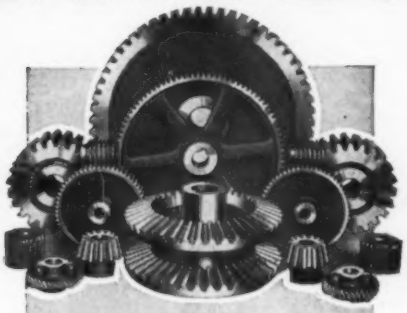
With so much depending upon the continued functioning of all mechanical equipment under severe fighting conditions on our far flung fronts it is particularly important that the varied gearing used on this mechanical equipment be the best possible.

The large number of plants, now engaged in War Work, using Cincinnati Gears gives evidence of their accuracy—adherance to close tolerances and dependability.

In order to facilitate and increase our present schedule of production we have increased our plant capacity.

We have, we believe, the most complete assembly of personnel, involving highly trained, skilled craftsmen . . . technicians . . . and engineers, plus the greatest range of precision machinery, instruments and testing devices obtainable.

Cincinnati Gear Company has gone "all out" for war production. We pledge our every effort to make more and more "Gears, Good Gears Only".

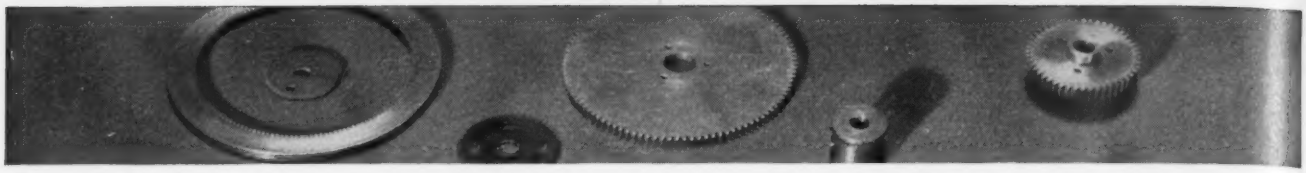


CINCINNATI
makes all kinds of gears

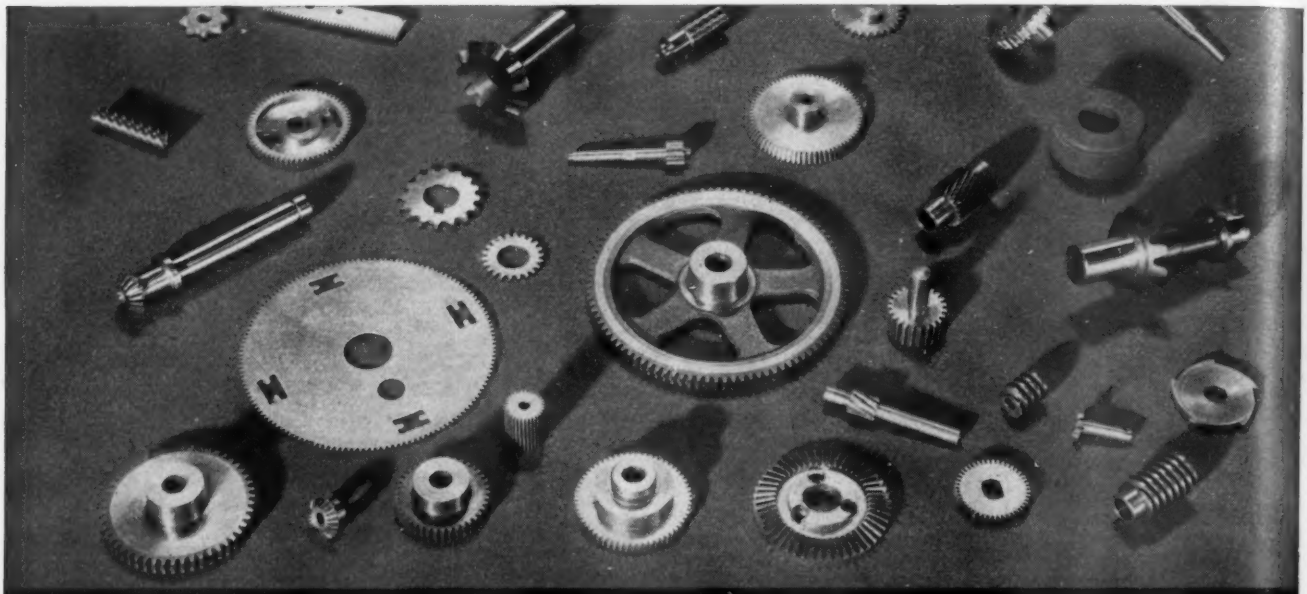
- SPUR
- BEVEL
- HELICAL
- SPLINE
- WORM
- SPECIAL

"GEARS Good Gears Only"

THE CINCINNATI GEAR COMPANY
MARIEMONT AVE. and WOOSTER PIKE • CINCINNATI, OHIO



Quaker City Gears Are Rolling with the Armed Forces on All Fronts



QUAKER CITY GEAR WORKS 1910-32 N. FRONT ST. PHILADELPHIA, PA.

GRANT GEARS

"64 YEARS" MANUFACTURING GEARS

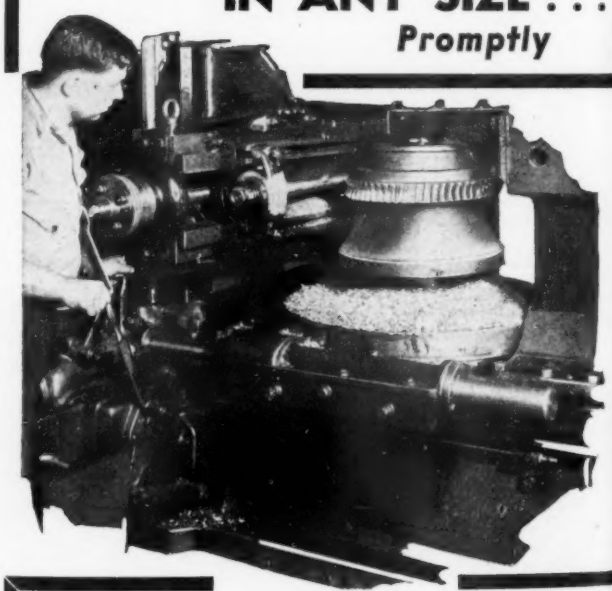
Despite the continued growth of our gear business we are still in position to give each customer the attention they have a right to expect.

We carry a complete stock of standard cut gears and can furnish special gears to your specifications.

GRANT GEAR WORKS
BOSTON, MASS.

ESTABLISHED 1877 — GEAR — BY GEO B. GRANT

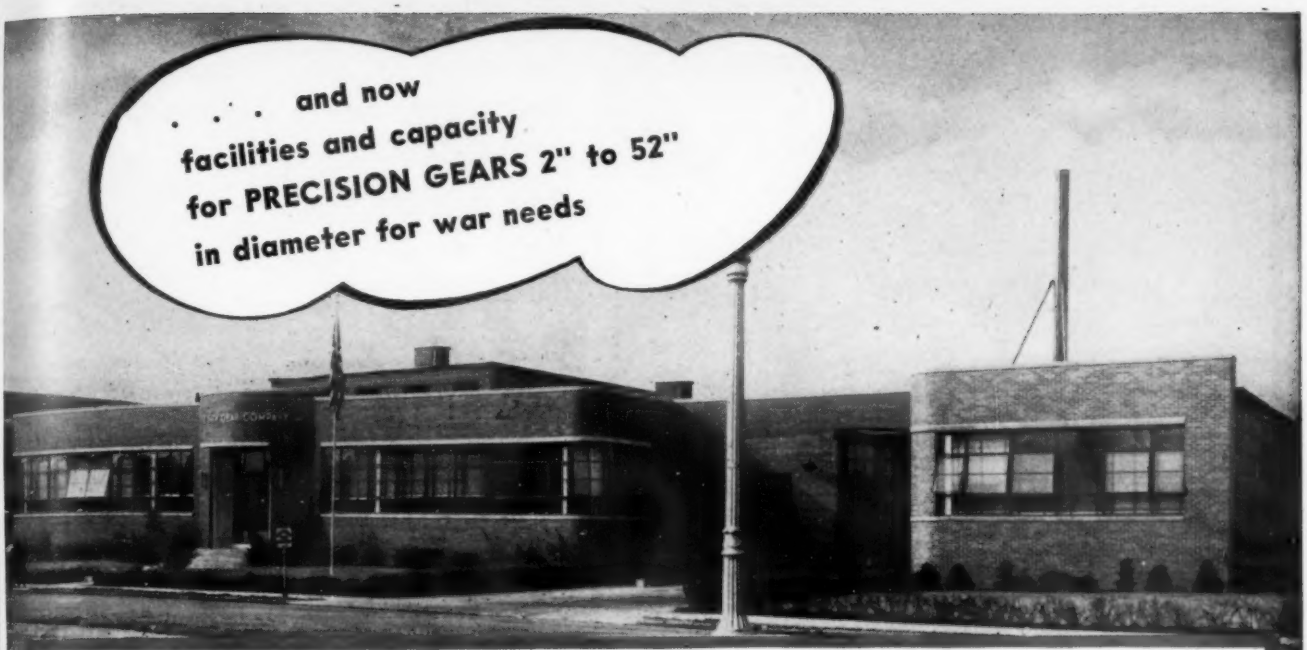
ANY KIND OF GEAR . . . IN ANY SIZE . . . *Promptly*



Just send us your specifications and ask us to quote on your requirements. With our modern facilities for producing gears of all kinds, you'll find our quotations attractive. Deliveries, too, in any quantities, can be made promptly.

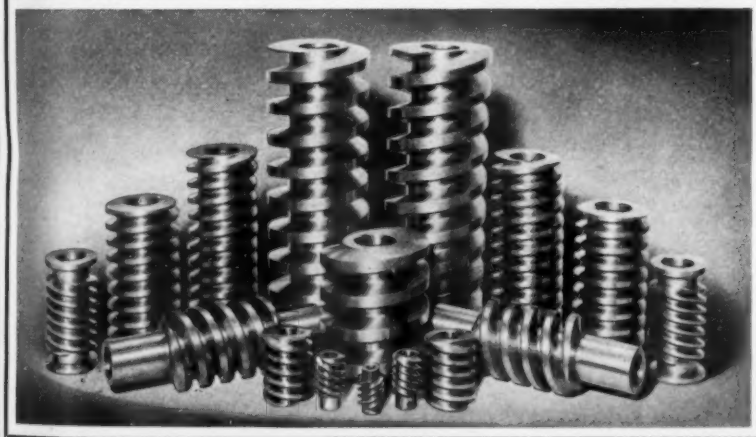
Sample Stahl service once and you'll come to us regularly for *all* your gears. Write today.

THE STAHL GEAR & MACHINE COMPANY
3901 Hamilton Ave. **Cleveland, Ohio**



Stamina and accuracy demanded in gears for war service are assured regardless of sizes and quantities required. You are invited to take advantage of Sier-Bath's added capacity to produce precision gears in a wider size range.

SIER-BATH GEAR CO.
Incorporated
NORTH BERGEN NEW JERSEY



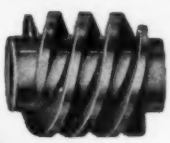
ADAMS GEARS

SPUR — HELICAL — WORM
BEVEL — MITER — RACKS

Splined Shafts A Specialty

THE ADAMS COMPANY
Est. 1883
1942 Bridge St. Dubuque, Iowa

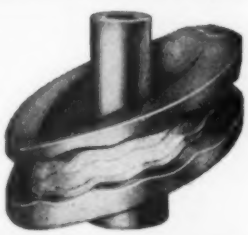
"HARTFORD" for Gears, Cams, Thread-Grinding



OUR SERVICE INCLUDES:

- . . . cutting gears of every description exactly to specifications
- . . . grinding gears, cams and threads
- . . . furnishing aeronautical parts on a contract basis

You plan and we execute—assuring speedy production, prompt delivery and reasonable price. Send blue prints or samples for estimate.



THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD, CONN.

GEARS – *Any Material*

FIBRE

STEEL

BRONZE

CHROME

GEARS OF ALL TYPES MANUFACTURED IN SIZES RANGING FROM 5/16" TO 16"

DETROIT BEVEL GEAR CO.

8130 JOS. CAMPAU • DETROIT, MICH.

Makers of Quality Gears for 30 Years

THE JOHNSON FRICTION CLUTCH

FLOATING PLATE CONSTRUCTION MINIMIZES DRAG, ABRASION and HEATING in the

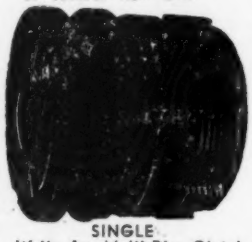
"MAXITORQ" MULTI-DISC CLUTCH

DOUBLE

Construction of the "MAXITORQ" is such that when in neutral, no disc touches the ones adjacent to it. A separator spring between each pair of inner discs spreads these endwise with an accordion action, so that light can be seen between all discs.

Floating plate construction is but one of several new and exclusive improvements developed by Johnson in "MAXITORQ" multiple disc design. Other features include manual assembly without the use of tools and quick and simple manual adjustment.

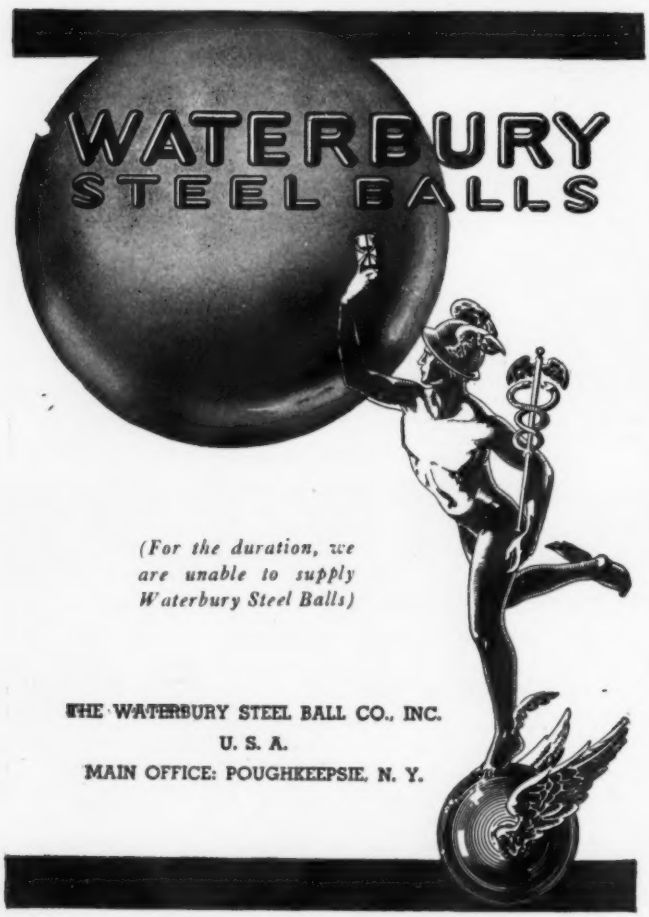
"MAXITORQ" CLUTCHES are ideal for machine tool and many other industrial applications. They are available in wet or dry plate single, double or cut-off coupling types in capacities from ½ to 5 hp. at 100 R.P.M. Write for detailed data sheets covering "MAXITORQ" CLUTCHES


SINGLE

Write for Multi-Disc Clutch Catalog No. 31 or Consult "Sweet's" or "Thomas Reg."

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER, CONN.

WATERBURY STEEL BALLS



(For the duration, we are unable to supply Waterbury Steel Balls)

THE WATERBURY STEEL BALL CO., INC.
U. S. A.
MAIN OFFICE: POUGHKEEPSIE, N. Y.

BEVEL GEAR RATIO

can be changed by merely changing the pinion.

BILGRAM

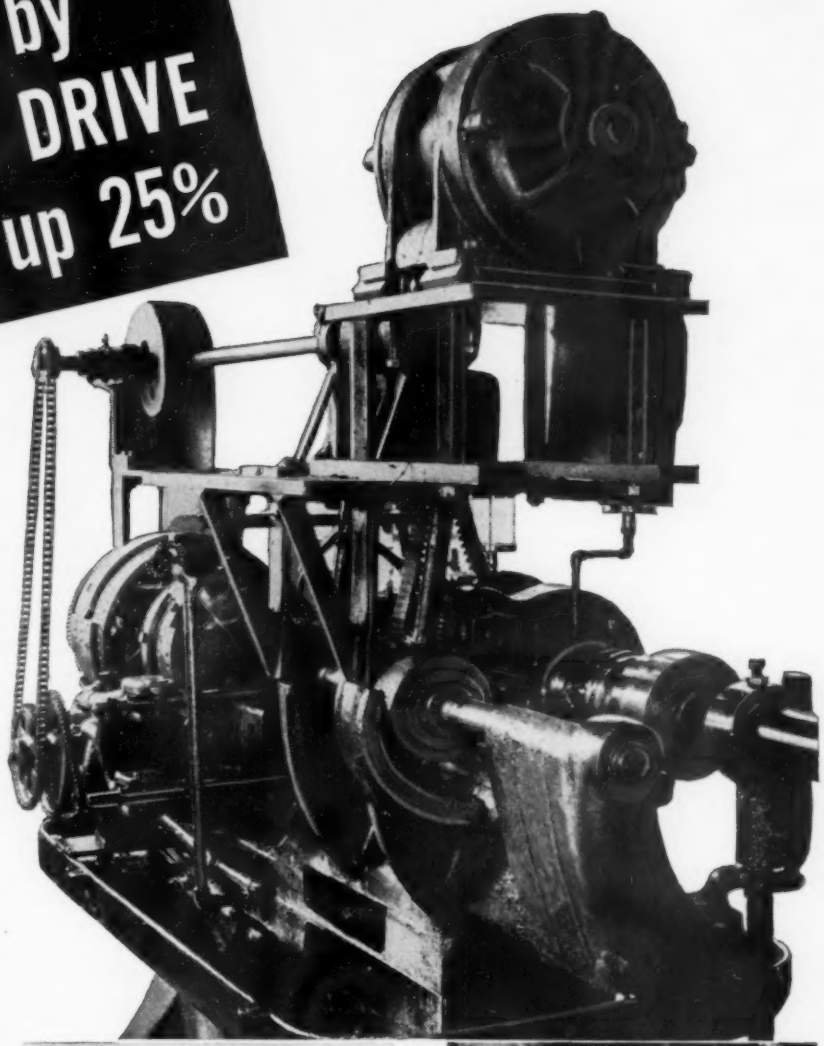
BILGRAM GEAR & MACHINE WORKS
1217-35 Spring Garden, Philadelphia, Pa.

SPECIALISTS...
not jacks of all trades!

To do one thing *perfectly* rather than many things well is the sole objective of every MEISEL gear. And being constructed with only the requirements of a specific job in mind, MEISEL gears function at maximum efficiency always. Whatever your gear problem, investigate the advantages of *specifically* engineered gear by MEISEL.

MEISEL PRESS MFG. CO.
946 Dorchester Avenue **Boston, Mass.**

Modernized by MORSE CHAIN DRIVE ...Production up 25%



"Production was boosted twenty-five percent when we replaced short-lived other types of drives with Morse Chains. Prior to modernizing with Morse . . down time, wasted power, short-lived drives and lost production let us down and doubled our cost of produced parts."—So a manufacturer of new machine parts told us after he had modernized with Morse Chain Drives!

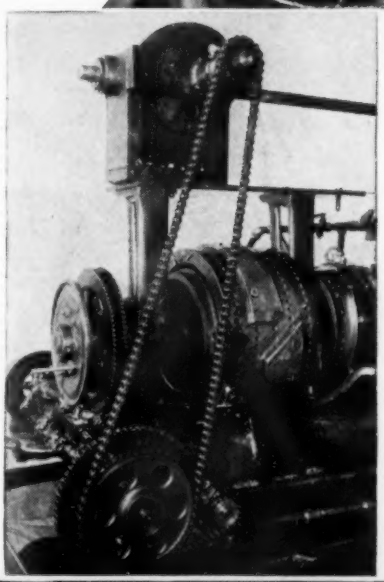
•

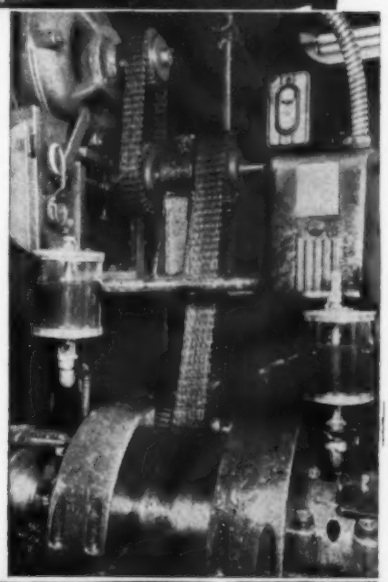
Operators of screw machines, and others where oil comes into contact with drives, find it especially wise to trust to Morse Drives . . because Chain Drives, unlike other types, are not affected by oil. Further, there is less take-up with longer-lived Morse Drives . . there are no wasted K.W.'s . . every R. P. M. is delivered to the job . . and more pieces are produced at lower cost.

•

Modernization of your machine tools with MORSE DRIVES can help you boost vital war production *Now!* Ask your nearby Morse engineer to help you with drives engineered to your job.

Morse products include silent chains, roller chains, sprockets, Morflex Couplings, radial couplings, silent chain couplings, roller chain couplings, free wheeling clutches, pullmore multiple disc clutches, silent automotive timing chains, marine reduction gears and special drives engineered to the job.



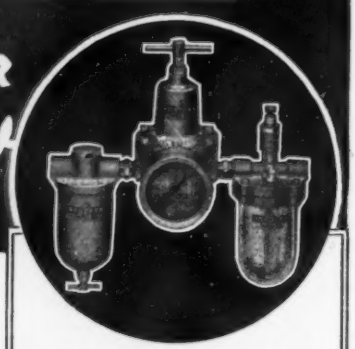


SILENT CHAINS ROLLER CHAINS FLEXIBLE COUPLINGS CLUTCHES

MORSE *positive* DRIVES

MORSE CHAIN COMPANY ITHACA, N. Y. DETROIT, MICH. DIVISION BORG-WARNER CORP.

Don't LET YOUR GUNS JAM Now



Every air tool in your plant is a gun on America's production front . . . direct-connected to the blazing guns on the battle lines!

Don't let wear and corrosion jam a single gun!

NORGREN (air borne) LUBRICATION checks wear during use; stops destructive corrosion when tool is idle.

More than 100,000 Norgren Units help air tools in dozens of vital industries stand up to the beating of 3-shift, 168 hours-per-week production.

They're doing more. NORGREN units guarantee you MAXIMUM POWER from every air tool . . . MAXIMUM MAN-HOUR OUTPUT.

***Check* wear during use; stop destructive corrosion when idle.**

Norgren LUBRO CONTROL Units consist of filter, pressure regulator, and lubricator. (Use together or in any combination . . . a size for every purpose.)

Inject exactly enough oil into air stream to maintain a film on every moving part. *Automatic:* start and stop with the air tool. *Sight-feed:* end guesswork.

★

C. A. NORGREN CO.
220 Santa Fe Drive
Denver, Colo.

Norgren

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How to save time by doing more reading

That is a profitable paradox for you. More true today than perhaps ever before. For here in the pages of this publication are packed many helpful ideas . . . considerable useful information. Much of it, in fact, available from no other source.

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330 West 42nd Street New York

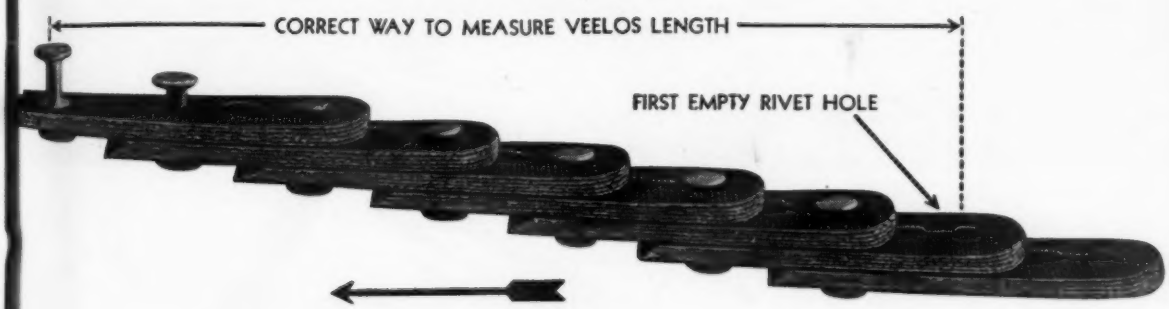
"LINK"

PRODUCTION

TO VEELOS FOR GREATER OUTPUT!

Veelos drives are peak production drives . . . because Veelos is the proved and practical link V-belt. Construction of the Veelos link permits installation and adjustment with a minimum of time and effort . . . assures smooth running. "Link up" your production with Veelos and speed ahead!

HOW TO MEASURE VEELOS



Arrow shows preferred direction of belt travel, although Veelos runs equally well in either direction. On V-flat drives, reverse the direction of travel.

To make a matched set of Veelos V-belts, measure one belt from end rivet to first empty hole as shown in diagram. Make all strands with the same number of segments. *The length of a Veelos belt should be 1" per foot shorter than the pitch length of the drive.* For "D" and "E" sizes, however, shorten only 3/4" per foot.

When desired belt length falls at some point between two rivets, use the rivet which most closely corresponds to the desired length. Veelos' resilience compensates for the fractional difference.

To shorten Veelos belt, simply remove links.

VEELOS

THE LINK

V-BELT

ADJUSTABLE TO ANY LENGTH

ADAPTABLE TO ANY DRIVE

MANHEIM MANUFACTURING & BELTING CO.

MANHEIM, PENNSYLVANIA

SHORTCUT *TO VICTORY*

with SKF-equipped drill presses

● *Built by* WALKER-TURNER CO., INC.

The roads to Rome, Berlin and Tokyo are paved with machines like this 900 Series Drill Press . . . machines that are relieving larger presses of producing holes in a hurry in vital parts for airplanes, tanks, armored trucks, guns, etc. And helping this drill press keep step with 1943's production demands are SKF Ball Bearings on quill, pulley, motor and roller locations. The more SKF Bearings on today's fast machines, the quicker and more accurate the job will be done. 5256

SKF INDUSTRIES, INC., PHILA., PA.

Tips

ON BEARING CARE

To make present equipment last longer

1. Use clean lubricant recommended by the manufacturer of this machine.
2. Avoid loads and speeds beyond those recommended by the manufacturer.
3. If necessary to remove bearings, keep them properly lubricated. Avoid the intrusion of water and dirt. Apply pressure on the inner race only. Don't hammer outer race.

SKF

BALL AND ROLLER BEARINGS

CENTURY FORM J MOTOR

Protection Against Falling Solids and Dripping Liquids

The top half of the motor is closed. Cooling air enters at both ends and is discharged below the shaft line.

The upper half of the Century Form J general purpose, open, continuous duty motor is closed to minimize the possibility of dripping liquids or falling solids entering the vital parts of the motor.

This added protection feature is made possible because of the scientifically designed Century mechanical ventilation system. All motors generate heat, so if the insulation is to have long life, the heat must be rapidly carried away from the windings. Two powerful fans located behind each bearing bracket draw cooling air "IN" through the bearing bracket openings. This cooling air is deflected first around the bearings to keep them cool and then across the windings and to air passages between the outer surfaces of the magnetic core and the frame—the heated air being finally discharged "OUT" through the openings located at the sides and bottom of the frame.

These modern, protected, industrial, general purpose motors meet the requirements of more than 80% of all polyphase motor applications. This Form J construction is at present available in 2 to 15 horsepower four-pole frame sizes.

Your Century Motor Specialist has full information and his wide experience may well prove valuable to you. We suggest you call him in today.

Century MOTORS

Help You Beat the Production Promise

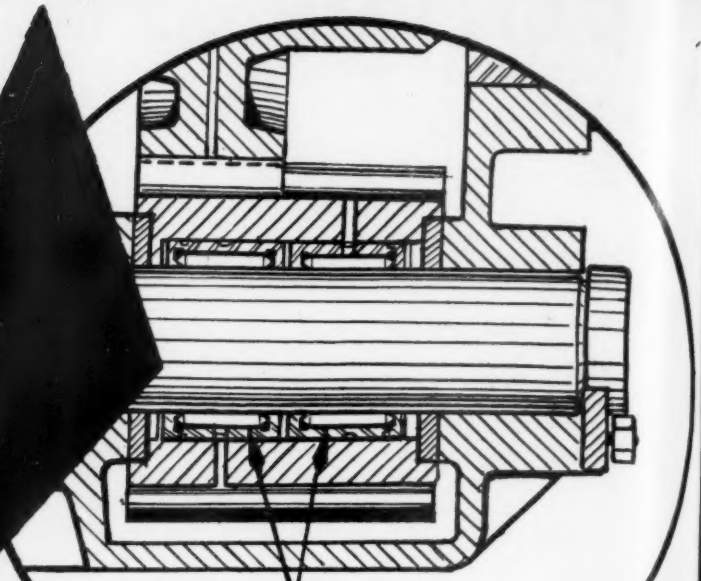
CENTURY ELECTRIC CO., 1806 Pine St., St. Louis, Mo.

Offices and Stock Points in Principal Cities

318

One of the Largest EXCLUSIVE Motor and Generator Manufacturers in the World.

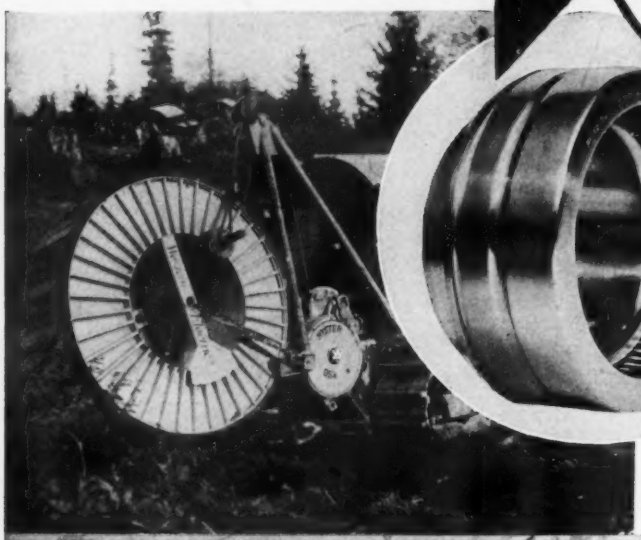
RBC CYCLOPS ROLLER BEARINGS



Used here on Reverse Idler Gear of

HYSTER

Towing Winches



← Cable Laying Operation

↓ Heavy Logging Operation

Here is heavy duty that demands top-flight performance — service in which RBC CYCLOPS Bearings are outstanding in their ability to operate efficiently over long periods of time. The high load carrying capacity of these anti-friction bearings is enhanced by the use of high carbon alloy bearing steel in both inner and outer races as well as the full complement of rollers.

ROLLER BEARING CO. of AMERICA

TRENTON . . . . NEW JERSEY

WHY DO HYDRAULIC CONTROLS GO HAYWIRE?

or Five Good Reasons for Using PennBell

WHEN THEY SLOW DOWN

Look for sticking valves and corrosion. These are caused by oil thickened by oxidation and containing acids. PennBell resists oxidation and the formation of acids and gums.

WHEN THEY'RE PLAIN JERKY

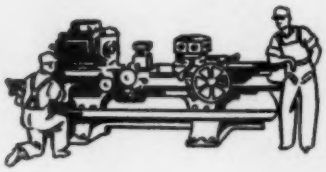
Caused by air trapped in oil that has mixed with moisture. PennBell's high demulsibility keeps this to a minimum, reducing foaming and aeration that cause erratic operation.

WHEN SPEED VARIES

Chances are, the oil is thick when cool, thin when warm. PennBell's high viscosity index keeps speeds uniform over a wide temperature range. Its body is little affected by temperature changes.

WHEN THEY WON'T STAY CLEAN

Deposits on valves and other vital parts are caused by unstable oil. These easily oxidized elements are removed from PennBell in the refinery, preventing gum formation.



WHEN THEY DIE TOO YOUNG

Hydraulic oil must lubricate efficiently to prevent abnormal wear. PennBell is refined to retain the natural lubricating qualities for which Pennsylvania crude is noted.

You Can Lick These Troubles Before They Start!

There's one sure way to get the precision and long life built into hydraulic pumps and machine-tool controls, with the least possible upkeep. And that's to give them the "life-blood" of a high quality oil.

PennBell, made especially for this service, is available in eight viscosity grades to meet every need. It is refined exclusively from Pennsylvania crude—and its qualities achieved *without the use of chemical or non-petroleum agents.*

PennBell offers you a hydraulic and lubricating oil (1) whose viscosity is little affected by temperature, (2) that separates readily from moisture, (3) that resists oxidation and acid formation, (4) that possesses excellent lubricating qualities.

Many builders of machine tools and hydraulic pumps have endorsed PennBell after laboratory and service tests. We'd like to put PennBell in the toughest job in your plant, and let its performance speak for itself. That fair enough?

GET THIS PRACTICAL ADVICE ON HYDRAULIC CONTROLS AND PUMPS

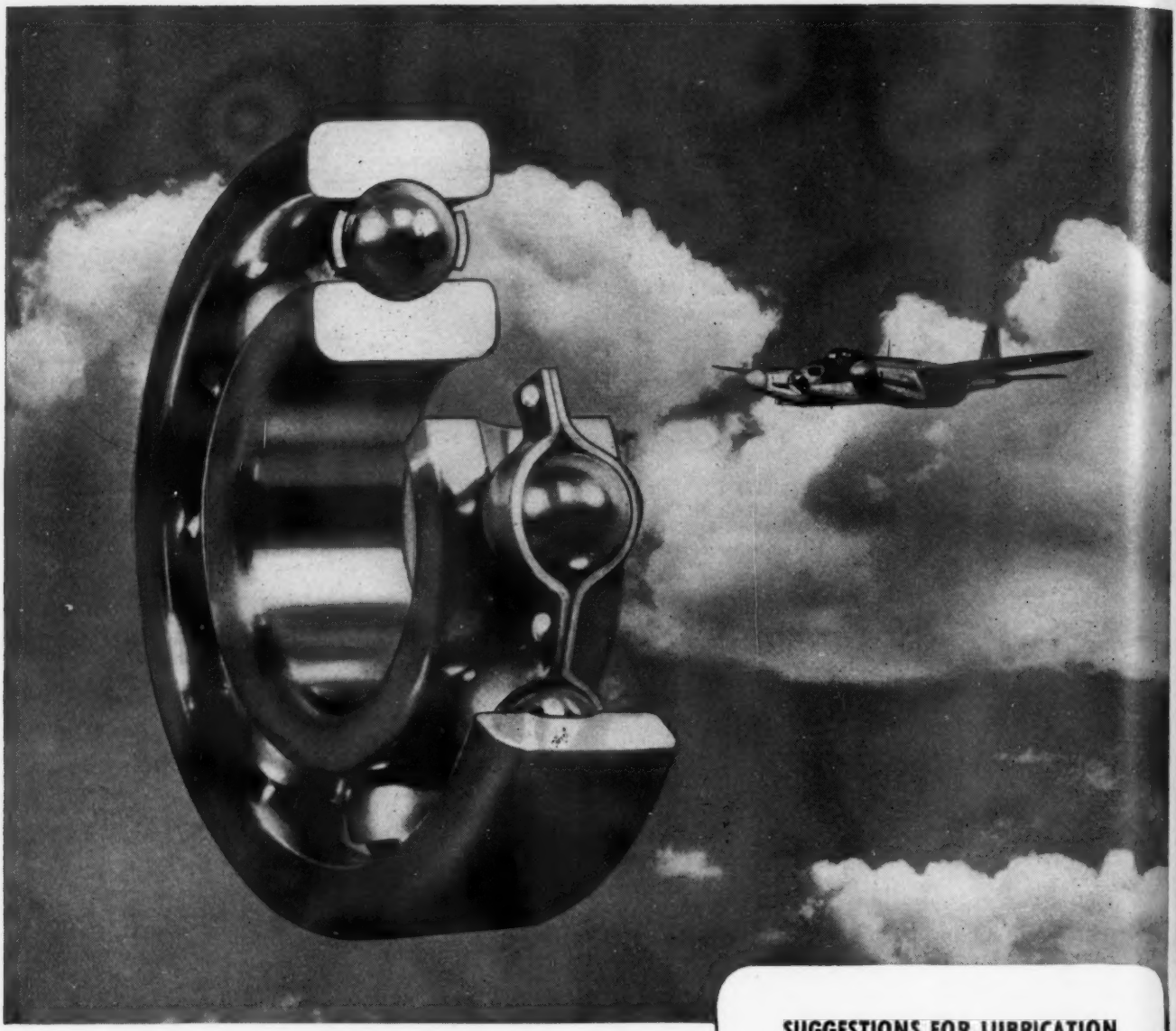
Pennzoil has prepared a new, illustrated bulletin describing briefly the hydraulic fluid requirements of these units. Cutaway views and diagrams make this a valuable addition for your files.

Write for Bulletin No. 10-AM, The Pennzoil Company, Oil City, Pennsylvania.

PENNZOIL *gives you* PENNBell

Largest organization in the world devoted primarily to the production, refining and marketing of Pennsylvania oils.

Refined from the highest grade raw materials available, to provide the finest quality hydraulic and lubricating oil for machine tool use.



Handle with CARE *for Longer* WEAR!

As implements of mechanized war, ball bearings rank with bombers! Without them, modern armies would slow down . . . stall . . . face annihilation. It pays to be sure that each of your BCA Ball Bearings is handled as carefully as a bomber pilot handles his plane.

BEARINGS COMPANY OF AMERICA, LANCASTER, PA.

BCA

RADIAL • ANGULAR CONTACT • THRUST

BALL BEARINGS

SUGGESTIONS FOR LUBRICATION OF BCA BALL BEARINGS

1. Choose lubricant carefully. Ball bearings can be lubricated either by grease or oil. The oils and greases used must be neutral mineral lubricants and be free from solid substances of any kind. They must not have a tendency to separate or to thicken and harden.

2. Avoid over-lubrication. When using grease, it is not advisable to have the housing more than one-half to two-thirds full. Loading a bearing housing with too much grease is a common cause for overheating; this is especially true in applications where the speed is in the upper range.

Treat Bearings Right!
They're in the Fight!

Regardless of Surrounding Temperature

THE THERMALOAD V

SOLENOID STARTER

Always Trips at the Same Overload

When specifying a motor starter, it is important to remember that the performance of the new Monitor Thermaload V Solenoid Starter is unaffected by extremes in ambient temperature. The exclusive Monitor Compensated Thermal Overload Relay . . . a time-proved feature of large Monitor controls . . . gives you assurance that the trip will always occur within a given time at the same percentage of overload. That's the kind of protection you need for your almost irreplaceable motors . . . the kind of protection that slashes motor maintenance costs . . . keeps production UP!

Supplementing this important feature, the Thermaload V offers these additional advantages . . . Vertical, Straight-Line Design; Resilient, Shock-Proof Mounting; Double-Break, Silver Contacts; Interchangeable Coils for different voltages; Tamper-Proof Re-Set Protection; Ready Accessibility of all parts. Supplied fully enclosed or without enclosure for panel mounting.

Write for complete details and delivery dates or see the Monitor field engineer in your territory.

• SMALL OVERALL DIMENSIONS . . .

indicate a better design . . . permit installation in smaller spaces. Available in four sizes . . . 1.5 to 7.5 H.P. . . . 110 to 550 volts (A.C.) . . . all fully approved by Underwriters' Laboratory.

The Monitor Controller Company

GAY, LOMBARD & FREDERICK STS. BALTIMORE, MARYLAND

Why we work against Inspectors

The inspector maintains quality by finding and throwing out substandard parts. **HECKER's** job is to help make subquality hard to find. We'd be the last to say that better tools, **HECKER** tools, make the inspector's job easier. But we do know that our tools have minimized rejects in many well-known plants.

In *designing and building* tools **HECKER** engineers work with firsthand knowledge of production problems. They know the men and machines of our many regular customers. They know the production problems of our own operations on close-tolerance parts for aircraft. Their extra know-how comes from the production floor where the problems are.

Your big problem may be to speed up your output per machine. Or, it may be reduction of rejects. Or both. Whatever it is, let us demonstrate **HECKER** service on your meanest tooling problem. Write A. W. Hecker, 1982 East 66th Street, Cleveland, Ohio, or 517 New Center Building, Detroit, Michigan.

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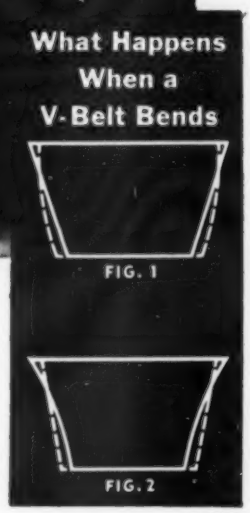

This Simple Test Shows the *Importance* of the CONCAVE SIDE!

432

You can see for yourself why belts built with the Concave side should be used in *your* plant if you will just pick up any straight-sided V-Belt and bend it as it bends in going around its pulley. As the belt bends, grip its sides as shown in the large photograph above. You will feel those sides *change shape*. The top of the belt, being under tension, narrows. The bottom, under compression, widens. The sides bulge out—as shown in Figure 1 (above, right).

Now bend a V-Belt that is built with the patented Concave side. The same shape-change takes place—but it merely *straightens* the precisely engineered Concave side, as shown in Figure 2. This belt, when bent, exactly fits its sheave groove. Two savings result. FIRST:—there is no out-bulge—therefore the entire side of the belt wears evenly and this means *longer life*. SECOND:—The entire side of the belt uniformly grips the sheave-groove wall. This carries heavier loads without slippage—a saving in belts for you, a saving in rubber for the nation.

Only belts built by Gates are built with the Concave side, a Gates patent.

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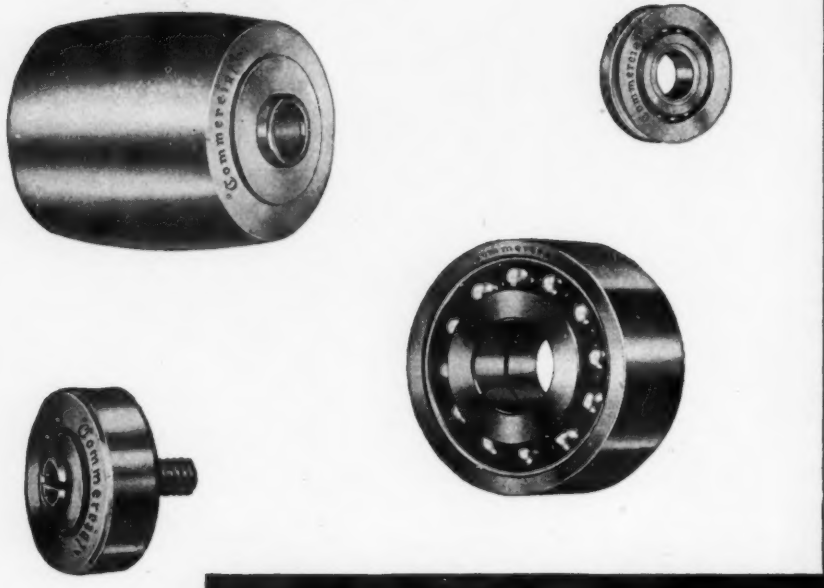

"Commercial" ANNULAR BALL BEARINGS

BALL BEARINGS FOR EVERY PURPOSE

"Commercial" Annular Ball Bearings are available in nearly all standard types and sizes. We also manufacture SPECIAL types of bearings designed for particular purposes—to meet your own needs and specifications. On this page, we illustrate special **"Commercial"** bearings used in various products. For instance:

BALL BEARING ROLLERS FOR TYPEWRITERS.
BALL BEARINGS FOR STRAIGHT EDGE CABLES.
BALL BEARING ROLLERS FOR OVERHEAD TROLLEY CONVEYORS.
TAPE ROLLER OR PULLEY FOR PAPER FOLDING MACHINES.

This gives some idea of the wide variety of bearings manufactured by us. All **"Commercial"** Bearings are precision built, accurate, tough and provide efficient, satisfactory service under all conditions.

FOR THE DURATION, WE ARE UNABLE TO SUPPLY MANY TYPES OF BEARINGS FORMERLY MANUFACTURED

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...I do mean "And Engineering"!

It is not enough, we think, to build top quality motors; rugged and smooth-running motors; motors of advanced design with unique protective features and low-maintenance advantages. This we do.

But, our job is not done until we have pooled our motor-building ability and engineering experience with your intimate knowledge of the operating requirements in your plant.

FOR MOTOR-DRIVE IS MORE THAN POWER. Properly applied, motor-drive can do *many things.**

Reliance Application Engineers—production minded men with broad experience in many industries—will welcome an opportunity to help you get the right answers to the question—*"What can we make the motor do besides supply power?"*

Just phone or write the Reliance office nearest you.

***Motor-drive provides within itself a means of:**

Speed Control	Reversing
Braking	Remote Control
Tandem Operation	Controlled Acceleration
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Slow Speeds for inching, threading, inspection

Applying them to boost production and improve quality is APPLICATION ENGINEERING. That's our business.

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RELIANCE ELECTRIC & ENGINEERING CO.
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A Gusher Pump delivers coolant exactly when you want it for honing, milling, grinding, cutting, tapping and threading . . . from a dribble to 200 g. p. m. No lost time . . . no bottleneck in production.

Simple design makes for efficient, dependable and trouble-free operation. Many *patented and exclusive* advantages no other pump can offer.

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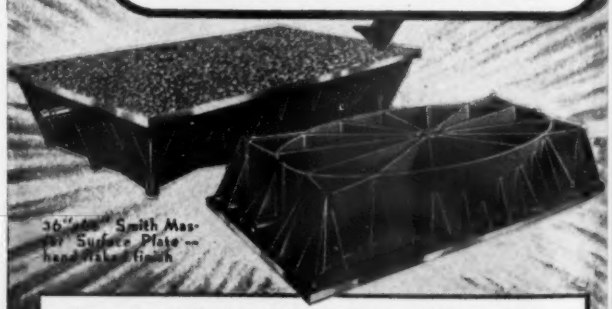
Largest Exclusive Builders of Coolant Pumps

For Close Tolerance Assembly and Inspection

SMITH MASTER SURFACE PLATES



Every Smith Surface Plate is a true Master Plate—with precision lapped surface, relieved by hand flaking to provide the maximum number of uniform bearing points to meet gauge makers' requirements and to prevent gauges and the like from freezing. On specifications requiring a total flatness tolerance of one ten-thousandths of an inch, medium size Smith Surface Plates have successfully met the test to the entire satisfaction of hard-to-please users. Tolerance on larger plates in proportion. A large variety of standard sizes ranging from 8"x 12" to 48"x 120". For prices and delivery write, wire or phone.

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who want to speed up shell stock cut-off

Find out how new high speed saws plus new cutting techniques are boosting output for shell producers . . . . . .

● Vastly increased output on shell stock and shell band cut-off has been achieved in many shell producing plants by Atkins engineers. By getting the *right saw* on the job and using that saw in the *right way*, cutting speeds have been greatly increased and subsequent machining operations reduced.

Basis of the new cutting speeds are Atkins Curled-Chip Saws. These modern metal cutting saws, as adapted to specific cutting jobs, permit stepped-up rates — rates nothing less than revolutionary when compared with the best of previous performance.

Call in an Atkins engineer to go over your shell cutting operations and show you exactly what can be done to save time and labor and reduce machine downtime on this vital work.

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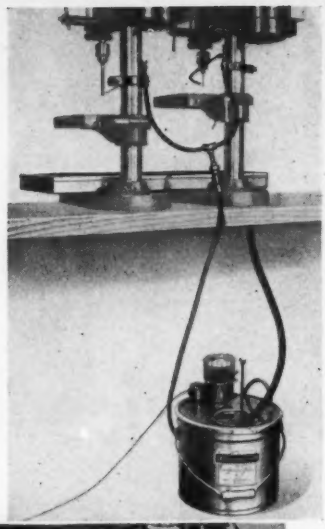
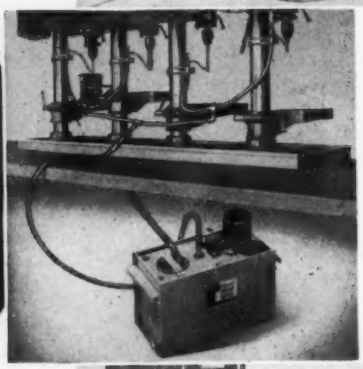
Another PRODUCTION INCREASING APPLICATION!

Gray-Mills *Portable* COOLANT SYSTEMS



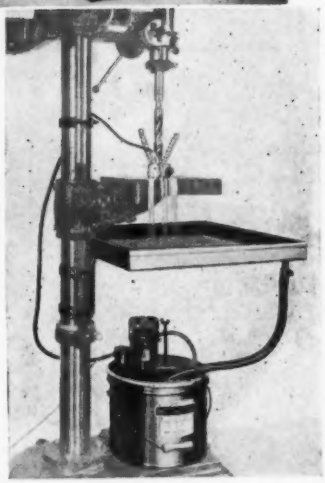
HELP good DRILL PRESSES do their best



INCREASE PRODUCTION --SAVE TIME & TOOLS!

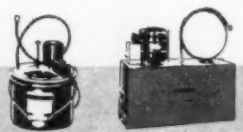
ON 1001 difficult operations drill presses like those shown, are working at top production speed—smoothly handling tough jobs—because they have the advantages of coolants applied with Gray-Mills Coolant Systems. Whether operating singly or in batteries, drill presses can be quickly and economically fitted with the proper size Gray-Mills System.

All types of equipment for drilling, milling, tapping, honing, cutting, belt grinding, sawing, etc. now have the advantages of coolants through Gray-Mills Systems. Use them in your plant to modernize older machines—equip small, large or special tools for greater efficiency—or as a standby and "clean-out" system. There are gear and centrifugal pump types with capacities from 50 to 1,000 gallons per hour—controlled flow. Prices from $39.50 to $132.50. Call your distributor or write. GRAY-MILLS CO., 227 W. Ontario St., Chicago, Ill.

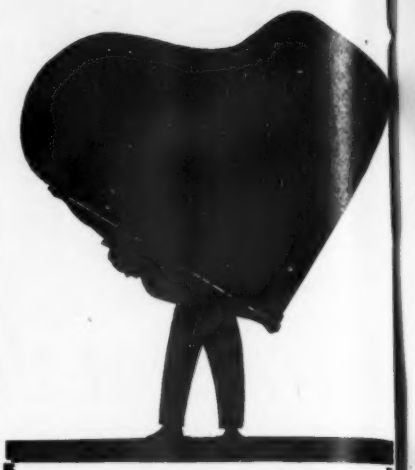


Gray-Mills G-2, G-2A and G-1 Portable Coolant Systems are supplying a controlled flow of coolants with ample pressures to the above installations of one, two and four drill presses.

GRAY-MILLS **Complete Portable COOLANT SYSTEMS**



Capacities 50 to 1000 G.P.H.
Pressures 8 to 150 lbs.



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WHAT would it mean to you to get five times faster production from one of your lathes?

WHAT would it mean to you to get eleven times faster production from one of your shapers?

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This may be possible. And with green, almost inexperienced, help.

We say it may be possible because it is being done in other metal-working plants. They have accomplished these performances by equipping their machines with Turchan Follower attachments.

This simple, hydraulic device handling work from a thin metal templet to wood or plastic jobs to extremely close tolerances. Capable of handling one, two or three dimensional jobs. Sizing is automatic. Hydraulic controls and hydraulic feed provide TURCHAN FOLLOWERS with additional speed and efficiency.

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Originators of complete hydraulic duplicating attachments

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"— because all parts of our defense are consolidated in a strong unity."
"— because all parts of our assembly are consolidated in a strong unity."

ALLEN HOLLOW SCREWS

HOLLOW SET, SOCKET HEAD CAP, FLAT HEAD CAP and "TRU-GROUND" SHOULDER SCREWS

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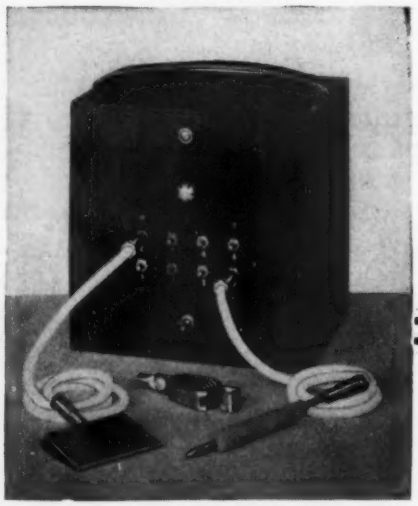
THE Etchograph WAY

3000 IN USE



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Three sizes to meet all requirements.

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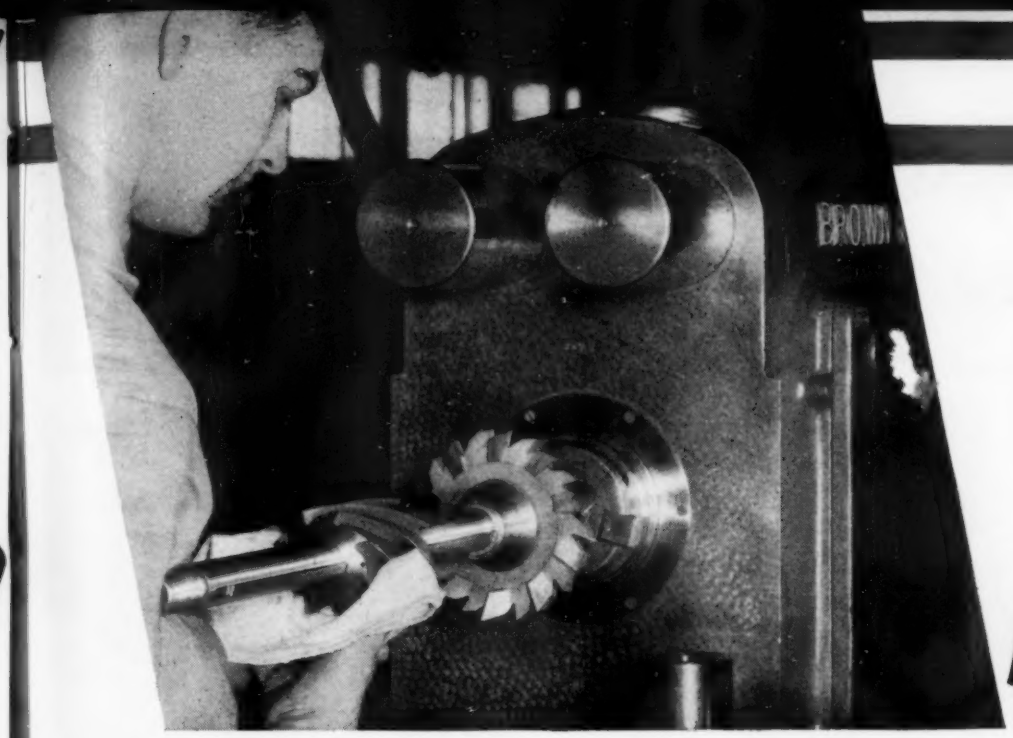

IN '43 . . . GET MORE OUT OF YOUR CUTTERS

Cutters must do a greater day's work than ever before. Only a limited supply is available to serve the demands of increasing production.

You can help by using more care than usual with your cutters. By following the suggestions here to get the utmost production from the cutters you use, you can help to do your share in our united war effort.

CHECK THESE POINTS

Chatter is a serious cause of poor finish, and damage to cutters. Too much tooth clearance and lack of rigidity of the machine or cutter drive are contributing factors causing chatter.

Mount cutter as close as practicable to the spindle.

With small cutters (such as end mills) be sure to run at the same surface feet as required for larger cutters.

Handle cutters carefully. Prevent damage to the cutting edges.

Watch cutters for wear. When dulling becomes excessive, too much metal is removed in the sharpening process. On a production job, sharpen the cutters after a predetermined number of cuts regardless of wear.

CHECK THE MACHINE Be sure machine is heavy enough to stand the cut — and in good condition • Use the correct spindle speeds with each setup • If coolant is needed, use enough.

CHECK THE ARBOR Use arbors of ample diameter • Insert shanks of arbors carefully in thoroughly-cleaned taper holes • Be sure ends of collars are not bruised • Provide adequate arbor support.

CHECK THE WORK Have the work clamped and supported properly • Work not rigidly held can cause premature cutter wear or even breakage.

Help the war effort—get the utmost in productivity and service from these critically needed cutting tools.

We are proud to be honored with the Navy "E", awarded for outstanding accomplishment in Defense production.

Brown & Sharpe Mfg. Co.
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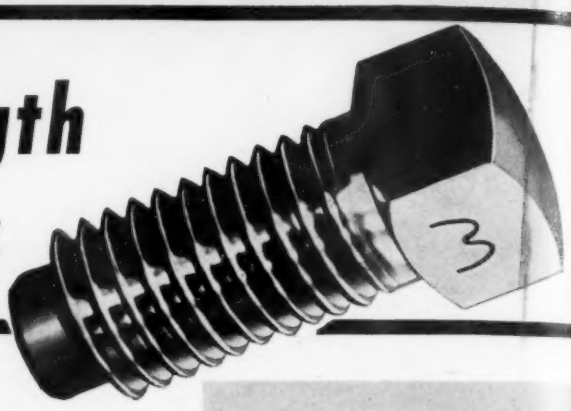
BROWN & SHARPE CUTTERS

Added Strength Saves Replacements



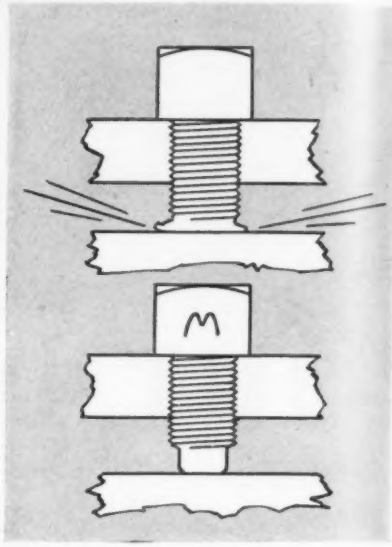
These Screws Have a Place in Your Plant

Where tremendous gripping power is necessary and projecting heads present no hazard, there is no substitute for just plain strength. Broken screws, upset points and fatigue failure can be avoided by specifying stronger screws.

Mac-its

PRONOUNCED "MACK-IT"

Mac-it Square Head Set Screws are heat-treated for maximum torsional strength and to resist upsetting of the points. A 5/8" Mac-it, for example, has a gripping power of more than 25 tons!



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Hexagon Socket Cap Screws • Hexagon Head Cap Screws • Hollow Set Screws Hollow Pipe Plugs • Stripper Bolts

4321

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Mechanics will welcome the introduction of the PAL Precision Gauge, with improved feature of close adjustment. The PAL Precision Gauge is a dependable and handy measuring tool and is offered at a very reasonable price. • The PAL Precision Gauge is 10¼ inches in height, has a full 6⅝ inch range. It can be converted from a calibre to a height gauge in ten seconds, and has direct reading inside and outside.

The PAL Precision Gauge has many new features, including the following:—Plastic base, making it lighter and rust proof; cast iron sole plate for longer wear; detachable scriber; swift motion assembler which eliminates all thumb screws; self-locking sensitive adjustment.

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2300 EAST THIRTY-FIRST STREET MINNEAPOLIS, MINNESOTA

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KNURLED SOCKET HEAD CAP SCREWS

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for free, accurate thread cutting in deep holes

Designed for tapping deep through holes or blind holes drilled deeply enough for chip clearance at bottom of hole. Cutting is done by the first few threads milled at an angle. Chips are forced ahead of tap, preventing chips clogging in flutes, thereby increasing strength of tap and minimizing chances of breakage.

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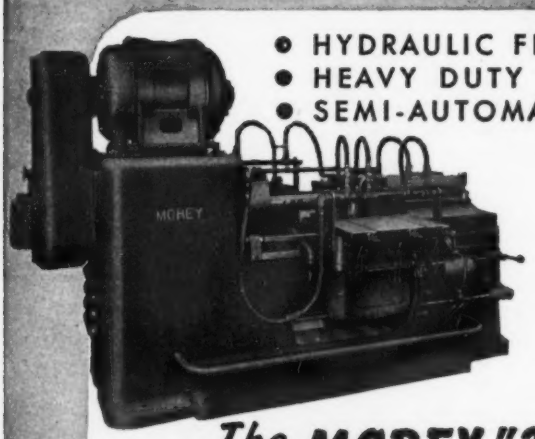

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- HEAVY DUTY
- SEMI-AUTOMATIC

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Timken Tapered Roller Bearings for Main Spindle—All Others Anti-Friction

The HYDRAULIC FEED insures an almost effortless operation. Rigid enough to use carbide tools to their full capacity—entirely self-contained—no outside or auxiliary equipment required! Details in Circular 715—ask for it.

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Convert any engine lathe into a turret lathe in 15 seconds, with JEFFERSON TURRET ATTACHMENTS. To fit bench lathes and lathes up to 24" swing.

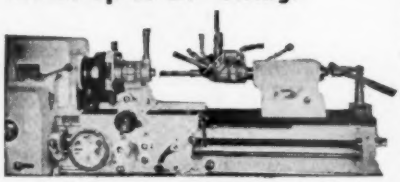
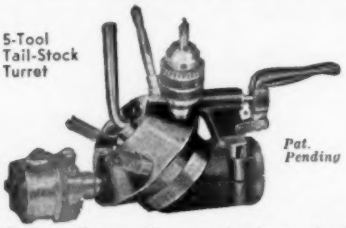


Photo Shows Turrets Applied to 16" Lathe

• This new modern **TOOL-POST TURRET** (below, right), made in 2 sizes, designed to increase production on engine lathes. Easily mounted on cross slide or compound rest. Has capacity of 4 standard tool holders which are easily inserted and rigidly held.

6 Days Delivery

5-Tool Tail-Stock Turret



Pat. Pending

Pat. Pending

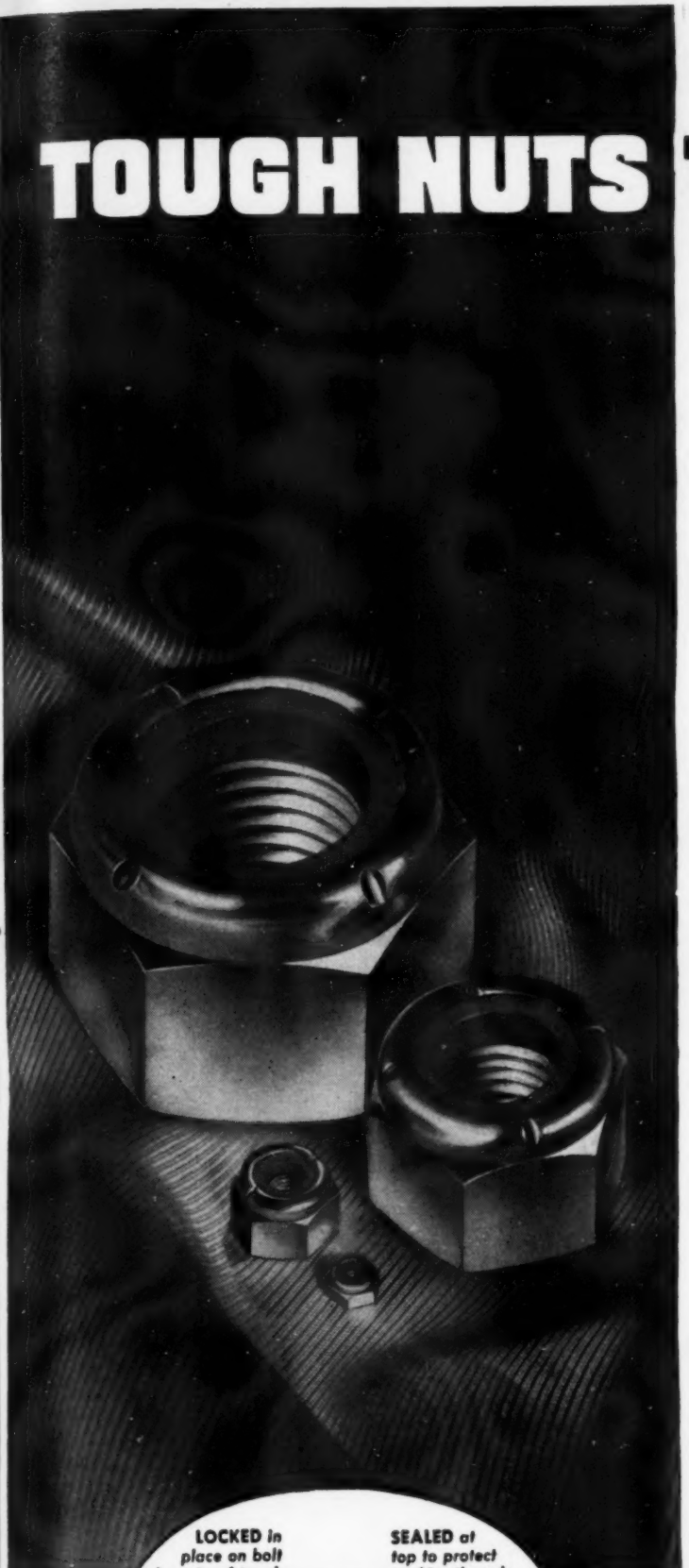
4-Tool Tool-Post Turret

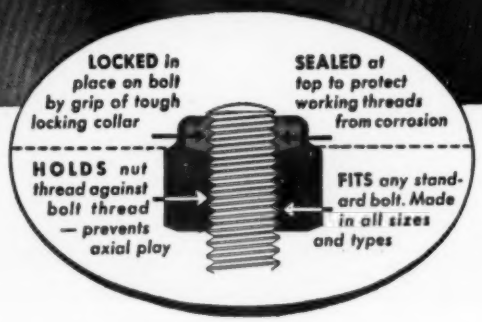
• Then there's the completely modernized 5-tool TAIL-STOCK TURRET (above), made in 4 sizes to fit small bench lathes and lathes up to 24" swing. Also the adjustable PULL-FEED LEVER. Jefferson Turrets are real production tools—substantial, rigid, accurate. They must not be confused with the small make-shift gadgets now on the markets.

• *Also — Milling Machines, Milling Machine Dividing Heads, Vises, Belt Sanders, Swing Frame Grinders, Gyratory Foundry Riddles.*

JEFFERSON MACHINE TOOL CO.
SO. SWEENEY, CUTTER & FOURTH STS. CINCINNATI, OHIO

TOUGH NUTS TO CRACK




LOCKED in place on bolt by grip of tough locking collar
SEALED at top to protect working threads from corrosion
HOLDS nut thread against bolt thread — prevents axial play
FITS any standard bolt. Made in all sizes and types

● We've made billions of Elastic Stop Nuts.

And to our knowledge not one has failed to do its job.

But the tough nuts we refer to now are the fastening problems which looked hopeless until Elastic Stop Nuts were used.

We've met lots of these in our day — and licked them.

There have been plenty of them in war production.

And how well these fastenings have filled the bill can best be told this way:

Every nut we can possibly produce is going into war goods. Yet even doubling our round-the-clock plant capacity hasn't let us gain on the demand.

In the days to come there will be many peacetime needs for these nuts.

Some will be simple. Others will look like "tough nuts to crack."

Our engineers like to meet both kinds. They stand ready to share their experience with you, work on your fastening problem and recommend the proper Elastic Stop Nut application for the job.

ELASTIC STOP NUTS

Lock fast to make things last

ESNA
TRADE MARK

ELASTIC STOP NUT CORPORATION OF AMERICA
UNION, NEW JERSEY

SURFACE PLATES ANGLES and CUBES

Precision Scraped

These units are all made of Meehanite iron recognized for its dense, uniform grain structure and its unusual wear-resisting qualities.

This assures a smooth, flawless surface that increases efficiency of your inspection.

The surface plate has scientifically designed ribs to give absolute rigidity and strength to the entire surface.

Send for complete folder giving sizes, weights, and prices.

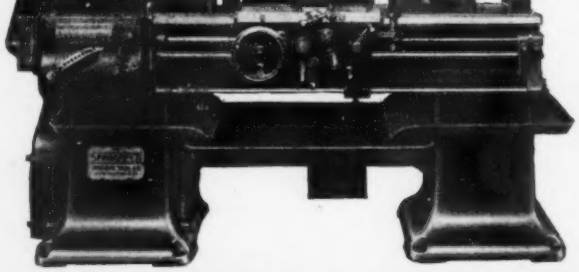
MACHINE PRODUCTS CORP.
6769 McNICHOLS ROAD • DETROIT, MICHIGAN

SPRINGFIELD

GEARED HEAD LATHES

. . . for peacetime or preparedness production!

A lathe purchased now . . . for 24 hours a day, 7 days a week operation . . . must still meet your normal peacetime requirements in the future. The flexible, diversified, all-over efficiency of SPRINGFIELD lathes stamps them as ideal for defense and regular production. In all sizes and types. Write for descriptive bulletins.



The SPRINGFIELD MACHINE TOOL Co.
SPRINGFIELD, OHIO, U.S.A.

DANLY
PRECISION DIE SETS
DANLY MACHINE SPECIALTIES, INC.
2100 S. 52nd Avenue, Chicago, Ill.
MILWAUKEE • LONG ISLAND CITY, N. Y.
DAYTON • DETROIT • ROCHESTER
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THEIR PRECISION
Means Greater Accuracy In Your Production
Danly Commercial Sets
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DIEMAKERS' SUPPLIES

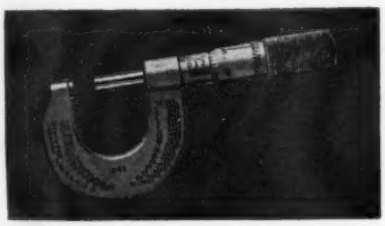
REED-PRENTICE

LATHES • DIE SINKERS • VERTICAL MILLERS • JIG BORERS
• DIE CASTERS • INJECTION MOLDING MACHINES •
REED-PRENTICE CORP. WORCESTER, MASS., U. S. A.

SCHERR MACHINISTS' TOOL SPECIALTIES

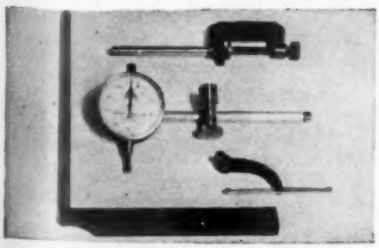
MACHINISTS TOOLS in a wide range of types for precision measuring of all kinds.

TOOL CHESTS with separate locks for open top and drawer section. Light weight but strong and durable.



REED MICROMETERS—accurate, long-lived, easy reading and sensitive. Made in several types.

"LITTLE WONDER" RADIUS DRESSER — will dress convex or concave radii from 0 to 1" without removing wheel guard.



DIAL INDICATORS—fully guaranteed for accuracy. Available with attachments for various uses.

MAGNE-BLOX

LAMINATED PARALLELS and V BLOCKS

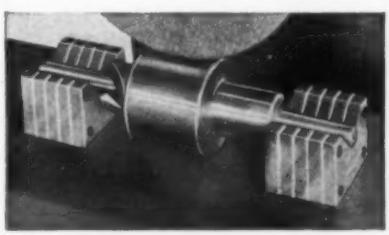
speed grinding by saving time in set-up

MAGNE-BLOX are designed especially for holding odd shaped pieces of work during grinding operations. Placed on the plane surface of the magnetic chuck they obtain their holding power by conduction. Work is held with practically the same force as would be exerted if the piece rested directly on the magnetic chuck.

Set up of irregular shaped pieces with MAGNE-BLOX is as easy as for regular pieces. No complicated clamps and holding devices are required.

MAGNE-BLOX Parallels and V Blocks may be used on all types of magnetic chucks. They provide a practical, inexpensive means for saving set-up time and holding odd shaped work securely without danger of scratching or marring.

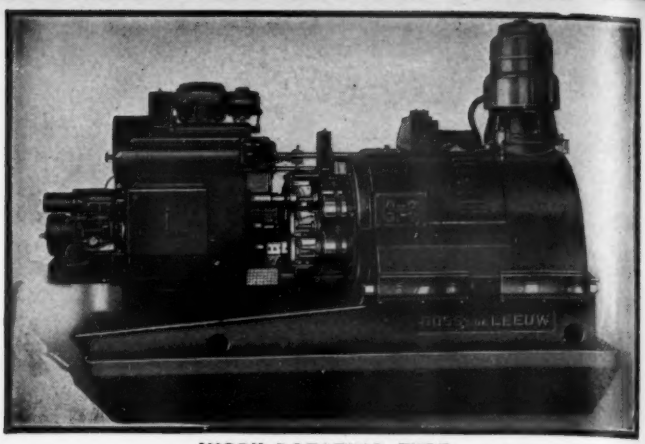
Made in several sets and available for prompt shipment on high priority orders. Write today for further details.



Using Magne-Blox for holding a cylindrical shape while briding the top flat.

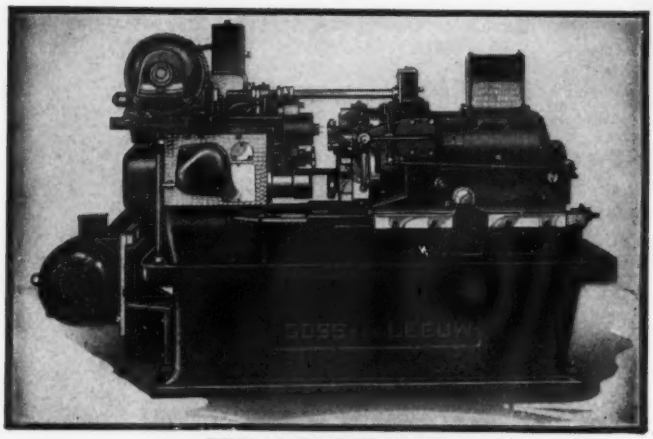
GEORGE SCHERR COMPANY, INC. 124 LAFAYETTE ST., NEW YORK, N.Y.

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES



WORK ROTATING TYPE

5 Spindles • 6 Spindles • 8 Spindles



TOOL ROTATING TYPE

4 Spindles • 5 Chucking Positions

Both types of machines provide lead screw threading. Oversize spindles on these machines are mounted on pre-loaded anti-friction bearings. Ways are hardened; gears are of chrome-nickel steel, carefully heat-treated.

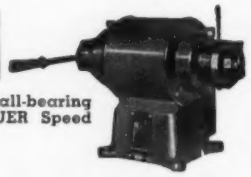
The many modern features offered in these machines are fully described in catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

SCHAUER *SPEED LATHES*

• for *Faster Finishing*

BURNISHING • BURRING
LAPPING • POLISHING



. . . of gears, pinions, pulleys, ball-bearing races and similar parts. Use SCHAUER Speed Lathes for increased production.

Awarded Oct. 24, 1942

"the originators of today's Speed Lathes"

SCHAUER MACHINE COMPANY

2067 READING ROAD, CINCINNATI, O.

LEADING THE INDUSTRY IN CARBIDE TOOLS SINCE 1930

Vascoloy RAMET

TANTUNG CUTTING TOOLS — DIES

439

VASCOLOY RAMET CORP. • NORTH CHICAGO, ILLINOIS

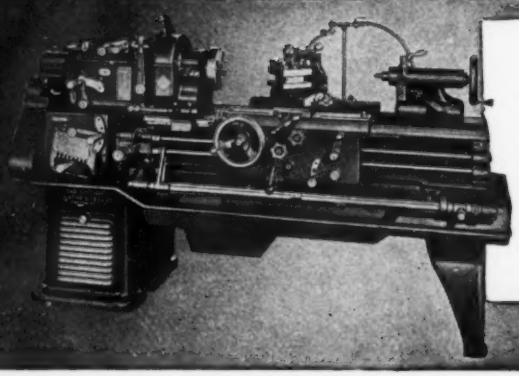
DAVIS KEYSEATER

This low cost machine will handle any keyseating job in the shop up to 1¼ in.

Write for illustrated bulletin

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

CINCINNATI LA



Rugged . . . Accurate Versatile . . . and Fast!

With these four qualities combined in perfect proportion, Cincinnati Lathes are capable of high production to the exacting standards required in aircraft, munitions, and other war work. Send us details of your war production jobs and let us help you tool up for maximum output using Cincinnati Lathes in 14" to 30" sizes. Write for latest catalog.

THE CINCINNATI LATHE & TOOL CO.

Rogers Road, Oakley Cincinnati, Ohio

SPECIALISTS SINCE 1906

You have backed us up with quick shipments...

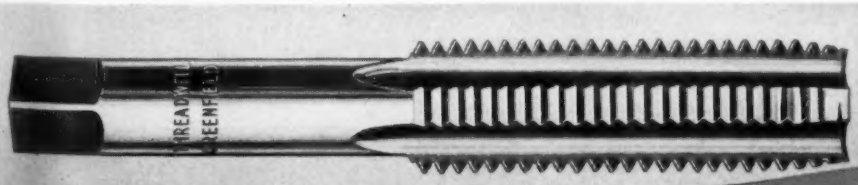
EXCERPT FROM CUSTOMER'S LETTER

The THREADWELL distributor in YOUR area is your own personal threading tool expediter.

You need a certain size tap . . . and need it at once. Perhaps important production schedules and deliveries hang on a thread . . . the thread that must be cut by a certain size tap to finish a certain part of your order.

Call your THREADWELL distributor! He will give *personal attention* to your needs . . . and so will we.

Don't misunderstand us. We are up to our necks in high priority orders. We can't deliver anything you might need anytime. But we can and do give our *personal attention* to every order. Often this *personal attention* can break bottle-necks and get customers the tools they want when they want them.



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CANADA: BRIDGE MACHINERY CO., MONTREAL
ENGLAND: SKYLUX LTD., LONDON

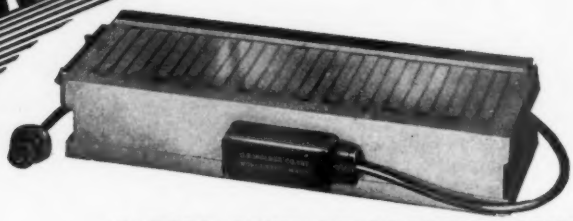
Threadwell

"TAPS OF DISTINCTION"

THREADWELL TAP AND DIE CO., GREENFIELD, MASS., U.S.A., FOUNDED 1902

WALKER MAGNETIC CHUCKS

Style B Face Plate — in standard diameters from 10⅜" to 36½" inclusive.



No. 617 Bar Pole Face Rectangular Magnetic Chuck.

DEMAGNETIZERS

Walker DEMAGNETIZERS are available in standard D.C. and A.C. types for either 110 or 220 v. Ask for Bulletin K7 giving detailed specifications.

A FULL LINE OF PROVED STANDARD DESIGNS

Walker offers prompt and complete service on magnetic chucks by carrying in stock a considerable line of Rectangular and Rotary types for use on all surface and internal grinding machines built by American machine tool manufacturers. These units—for grinding, milling, planing and turning operations—are of proved design and are available in such a complete range of sizes as to enable you to select standard units for practically any chucking problem. Write for bulletin W4 giving detailed information.

Also special CHUCKS *for special* NEEDS

The design of Walker Magnetic Chucks is such that "specials" can be developed and furnished at prices only slightly more than standard units. If you require special magnetic chucks for special purposes, consult Walker and be assured of prompt, economical service.

O. S. WALKER CO., INC.

WORCESTER, MASS.

HARDNESS TESTER

Let the SCLEROSCOPE speed up the production of that's so we can blow the Axis to HELL

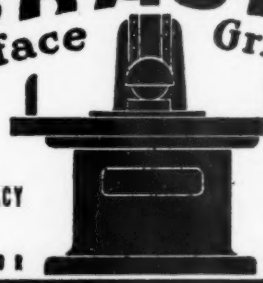
Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.

9025 VAN WYCK AVENUE
JAMAICA, NEW YORK

TELEPHONE: JAMAICA 6-4090

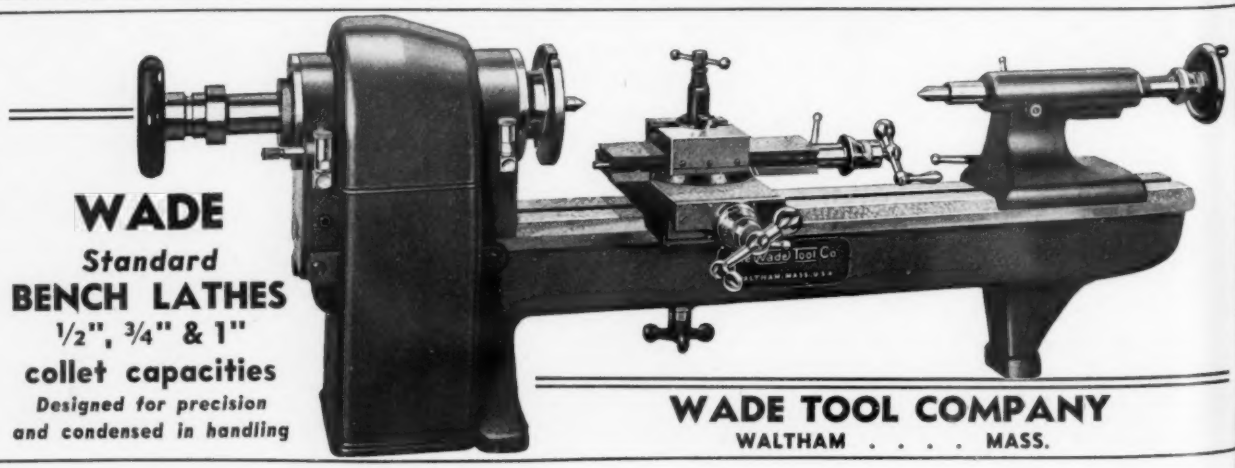
ABRASIVE Surface Grinders



QUALITY ACCURACY DURABILITY ECONOMY

WRITE FOR PARTICULARS

ABRASIVE MACHINE TOOL CO.
EAST PROVIDENCE, R. I.



WADE

Standard

BENCH LATHES

½", ¾" & 1" collet capacities

Designed for precision and condensed in handling

WADE TOOL COMPANY
WALTHAM . . . . MASS.

L-W

HIGH SPEED POWER HACK SAWS
LOW PRICE ··· HIGH QUALITY

The Ideal Saw for any Shop

GRAVITY FEED
LENGTH GAUGE
EXPANDING CLUTCH
DOVETAILED SAW FRAME GUIDE

BUY WAR BONDS

● Automatic trip stops the machine on completion of cut.
Automatic Relief of the saw blade on the non-cutting stroke is also provided.
Capacity 6" x 6" with 10" to 14" blades ··· Clutch Pulley 12" x 3" ··· speed of pulley 120 R.P.M.
This heavy duty Power Hack Saw is highly efficient and accurate in operation. The Saw Frame is so designed that maximum rigidity is obtained. The sliding bearing is dovetailed to fit the arm and is adjustable in all directions. Belt drive, only $180.15.
Furnished, on request, is the 3-speed V-belt Motor Drive Arrangement ··· permits three speeds varying from approximately 90 R.P.M. to 130 R.P.M.; less motor—$29.50.
Motor recommended for use with drive arrangement—½ H.P. standard speed 1725 R.P.M.

L-W CHUCK Company

1-7 N. ST. CLAIR ST., TOLEDO, O.

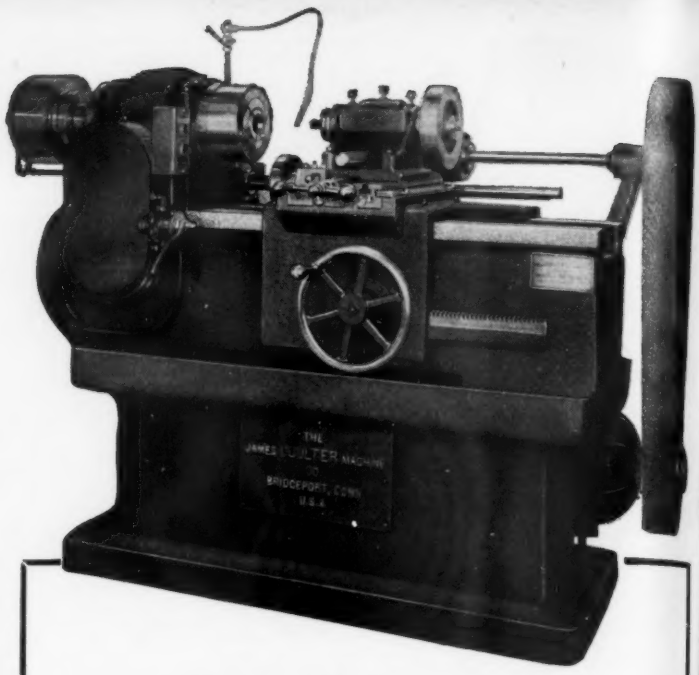
Also manufacturers of
Demagnetizers
Lathe Chucks
Magnetic Chucks
Milling Machine Vises
Dividing Heads

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL THREADS

The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.



Send for Descriptive Bulletin giving full information.

The James COULTER *Machine Co.*
BRIDGEPORT • CONNECTICUT • U.S.A.

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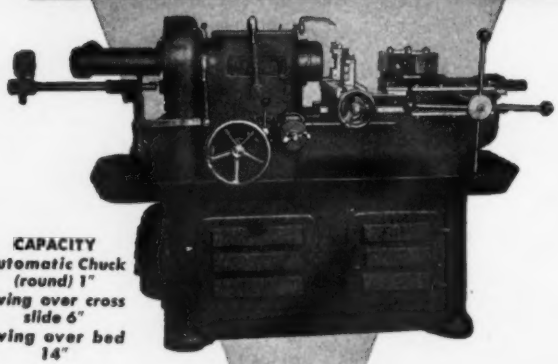
for ECONOMY—for HIGH SPEED PRODUCTION

The MOREY 2G
Back-Geared
TURRET LATHE
Timken Bearing
Self-Locking Turret and Infinite Spindle Speeds

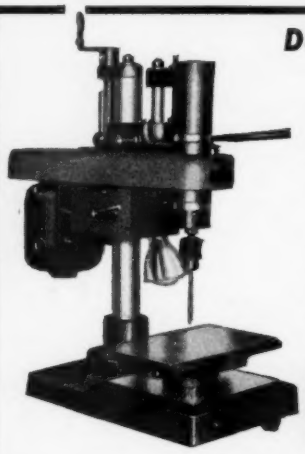


CAPACITY
Automatic Chuck (round) 1"
Swing over cross slide 6"
Swing over bed 14"

Thousands of the MOREY 2G Turret Lathes are saving money with no sacrifice of high speed production. Economy features: Back Gears are instantly thrown in through extra large Twin Disc Clutch—Full advantage from high speed and carbide tools—Vibrationless precision and an infinite variety of spindle speeds for every job—Timken bearing—Self-locking turret. Can be furnished with tooling.

Ask for Circular 629 for full details

MOREY MACHINERY CO., INC
410 BROOME STREET • NEW YORK, N. Y.



Do your sensitive drilling on a

MAXI-JR-E

● Here is a high production unit for small holes from .004" to .250" diameter. Sturdy — smooth — fast —it is a self contained unit with 8 inch vertical adjustment on column. Drilling unit overhang from center of chuck to column 5". Vertical capacity 10". Available in spindle speeds from 750 to 12,000 r.p.m. Write for bulletin.

The Hamilton Tool Co.
HAMILTON OHIO

BRIDGEPORT "ABRASAW"
Wet Cut-Off Machines are MODERN and MONEY SAVING

They do a Real Job. Ample power. Good clean cut, without heating the metal. Two sizes, for solids up to 2½" and tubing up to 3½".

Send for Descriptive Circulars

BRIDGEPORT
Safety Emery Wheel Co., Inc.
1286 W. BROAD ST.
BRIDGEPORT CONN.

Automatic Recessing—

The "KNOW HOW" of Grooving

WHERE grooves or recesses are to be cut, whether internal or external, SCULLY-JONES AUTOMATIC TOOLS will speed up and increase your production. Tools of this type may readily be used in drill presses, thus freeing more urgently needed machines. • Fine adjustments are provided for controlling diameter and the location of grooves. • On some styles, the use of various interchangeable cutters in one body, make it adaptable to different recessing operations.

FACING AN INTERNAL BOSS ON "JEE" MOTOR CASTINGS WHERE OBSTRUCTION USUALLY CAUSES DIFFICULTY.

FORMED RECESSES MADE IN ONE OPERATION ON DETONATOR BUSHINGS OF LARGE CALIBRE MOTORIZED ARTILLERY RIFLES.

GROOVE FOR THREAD CLEARANCE CUT ON ANTI-AIRCRAFT PROJECTILE WITH AUTOMATIC "NECKING" TOOL.

CASTING OF PART FOR ARMY TANK ON WHICH TWO RECESSES ARE MADE AT ONE TIME.

RADIUS CUT MADE IN PART FOR STEERING GEAR MECHANISM OF POWER TORPEDO BOAT.

BOTH INSIDE AND OUTSIDE CLEARANCE GROOVES CUT IN ONE OPERATION ON OIL TANK CAPS FOR SUBMARINES.

SNAP-RING GROOVES CUT IN WRIST PIN HOLE OF AIRPLANE PISTONS.

HEAVY UNDERCUT AND CHAMFER MADE IN ONE OPERATION ON LARGE NAVAL GUN PROJECTILE.

SCULLY-JONES AND COMPANY

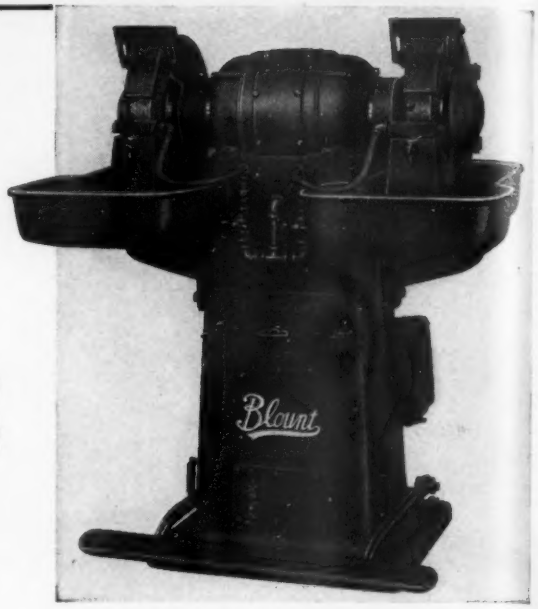
1901 SO. ROCKWELL STREET • CHICAGO, ILLINOIS. U.S.A.

"Blount"

"COMBINATION" MODEL J

WET TOOL GRINDER

meets todays need for speed and accuracy



This machine is a valuable contribution to fast production. It is equipped with straight faced wheels for wet grinding, is remarkably convenient in operation and can be depended on for cool, clean grinding.

Modern and improved features include:

. . . heavy column with ample coolant tank and water pan of generous capacity.

. . . guards of heavy cast iron with hinged covers and adjustable spark protectors.

. . . centrifugal motor-driven ball bearing pump with all bearings above water line.

. . . spindle of high carbon steel, machine turned and ground.

. . . deep groove ball bearings protected against grit.

. . . exclusive design Blount grinding rest incorporating coolant ejector which assures cool tools and clean wheels.

. . . totally enclosed motor with manually operated switch having overload protection.

. . . foot treadle switch (available as an extra) keeps machine running only while operators foot depresses treadle.

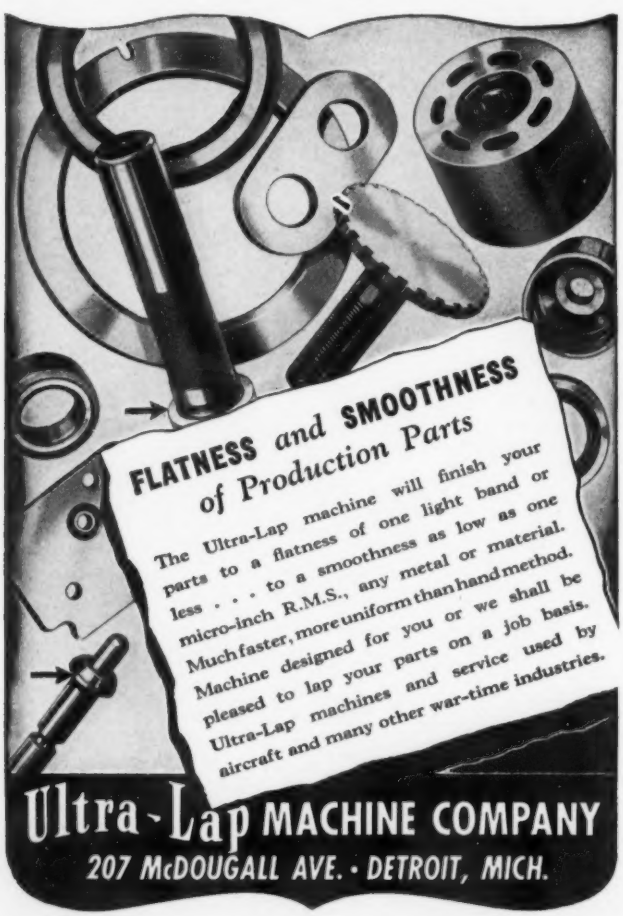
Write for Bulletin A-8

COMPLETE DETAILS AVAILABLE ON REQUEST

CONDENSED SPECIFICATIONS

Base of Column—22" x 19½"
Height base to spindle—37½"
Spindle Arbor—1¼"
Wheels 12" x 2" x 1¼"
Between wheels—22½"
Spindle speed—1750 R.P.M.
Motor—2 HP.

J. G. BLOUNT COMPANY *Everett, Mass., U.S.A.*



FLATNESS *and* **SMOOTHNESS** *of Production Parts*

The Ultra-Lap machine will finish your parts to a flatness of one light band or less . . . to a smoothness as low as one micro-inch R.M.S., any metal or material. Much faster, more uniform than hand method. Machine designed for you or we shall be pleased to lap your parts on a job basis. Ultra-Lap machines and service used by aircraft and many other war-time industries.

Ultra-Lap MACHINE COMPANY
207 McDOUGALL AVE. · DETROIT, MICH.

The BARNES PRECISION CUTTER GRINDER

Grinds any profile desired with SPEED and ACCURACY

Regardless of how complicated or irregular the gang or cutter, the "Barnes" will grind it to the exact form desired with an accuracy that leaves nothing to be desired.

The speed and savings assured by this machine are available without any need to change existing cutter equipment. With the Barnes Precision Cutter Grinder the use of profile ground formed cutters is made possible thereby assuring the production of the high quality and quantity of work for which this type of cutter is so well known.

Write for Descriptive Circular

GENERAL MACHINERY CORP.
140 Federal St. Boston, Mass.

TEN TIMES THE LIFE OF TOOL STEEL CENTERS

because

Red-E centers have high speed steel ends

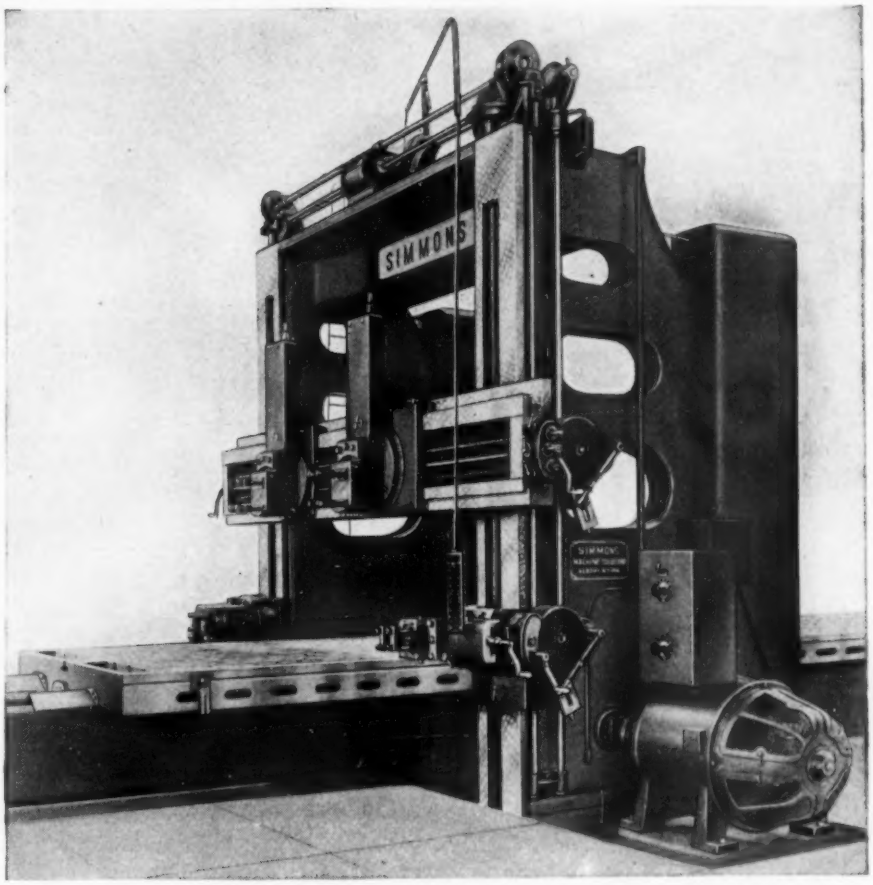
The Ready Tool Company
Iranistan & Railroad Aves.
Bridgeport, Conn.

THREE WEEKS DELIVERY!

120" X 96" HEAVY DUTY PLANER

Features

- **FORCED FEED LUBRICATION to the ways.**
- **HERRINGBONE GEAR DRIVE for smooth flow of power.**
- **POWER RAPID TRAVERSE to all heads.**
- **DOUBLE-LENGTH ENCLOSED BED . . . double-plate box table.**



SIMMONS can now ship its new Heavy Duty Planer three weeks from receipt of order. Tables of varying sizes are available.

This rugged planer has been engineered to provide smooth finish-cutting on all classes of large work—even when the machine is planing at full capacity. It has passed the most rigid performance tests of a number of important war plants.

Power Rapid Traverse, operated through specially designed clutches, is applied to all heads. Traverse and feed are interlocked, with the result that it is impossible to engage both at the same time. Pulling up the Rapid Traverse lever engages the fine-tooth safety clutch, setting the table in operation in one direction. Pushing down reverses the direction.

The Inner Guide Box Table has one flat and one vee way, and rides on a film of oil delivered by pump into the bed channels for the entire length. The bottom of the table is entirely closed. Heavy ribs at short intervals tie the top and bottom securely together.

Other important equipment: Box arch full depth of housing; ball thrust bearings on rail and sidehead feed screws; adjustable taper gibs throughout; micrometer collars for horizontal and vertical feeds; power elevating device for the rail; all gearing completely covered; rail clamp on inner and outer edge of housings.

Write TODAY for descriptive bulletin giving complete details. SIMMONS MACHINE TOOL CORPORATION, 1759 North Broadway, Albany, N. Y.

SIMMONS

LATHES · TURRET LATHES · MILLERS · PLANERS · 6" BAR BORING MACHINES

VITRIFIED

Keep production on its toes by standardizing on . . .

VITRIFIED GRINDING WHEELS

The Vitrified complete line includes also Silicate, Shellac and Resinoid bonded wheels for conditions requiring high finish, elasticity and heat resistance.

Vitrified Wheels

Grinding equipment—for tools or for production requirements—can be brought to higher degrees of precision and speed by standardization of Grinding Wheels.

These objectives can easily be realized through the use of Vitrified Wheels for every grinding operation, because Vitrified offers a complete line of sizes, shapes and types, processed especially for the work to be handled.

. . . Cast Iron, Bronze, etc., can be ground at low cost and efficiency on Vitrified Carborite Wheels. . . . For accurate, fast grinding of steel on a production basis, Vitrified Borite Grinding Wheels increase output and reduce costs.

. . . Also, make Silicate, Shellac and Resinoid Bonded Wheels.

Ask a Vitrified representative to show you how economically you can modernize your grinding operations by standardizing on Vitrified Wheels.

VITRIFIED WHEEL CO.
WESTFIELD MASS.

FOR HOLDING END MILLS AND OTHER TOOLS YOU CAN RELY ON UNIVERSAL COLLET CHUCKS

For gripping a tool "as strong as solid steel itself," you simply cannot beat a Universal collet chuck. The Universal chuck in the operating picture shown is holding a Putnam end mill while roughing cuts in high chrome steel. Universal chucks have ground threads, ample room for tool feed out and nut for Spanner wrench. Write for facts.

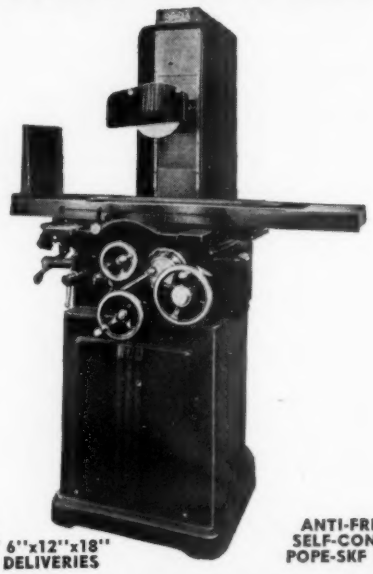
PHOTO COURTESY PUTNAM TOOL COMPANY

UNIVERSAL ENGINEERING CO.
FRANKENMUTH • MICHIGAN

ATLANTIC

No. 2 Automatic Precision

SURFACE GRINDER



CAPACITY 6"x12"x18"
PROMPT DELIVERIES

ANTI-FRICTION
SELF-CONTAINED
POPE-SKF SPINDLE

ATLANTIC MACHINERY CORP.
149 Broadway New York, N. Y.

The tungsten, molybdenum, chromium and other elements that harden your high speed tools are more critical than steel. To insure their preservation, segregate tools from other steel scrap — keep tools of the same alloy type together. To insure a continued and plentiful supply of new high speed tools, get your old tools and dies to the scrap dealer or back to the mill just as soon as you have no further use for them.

NATIONAL

NATIONAL TWIST DRILL & TOOL DETROIT U.S.A.

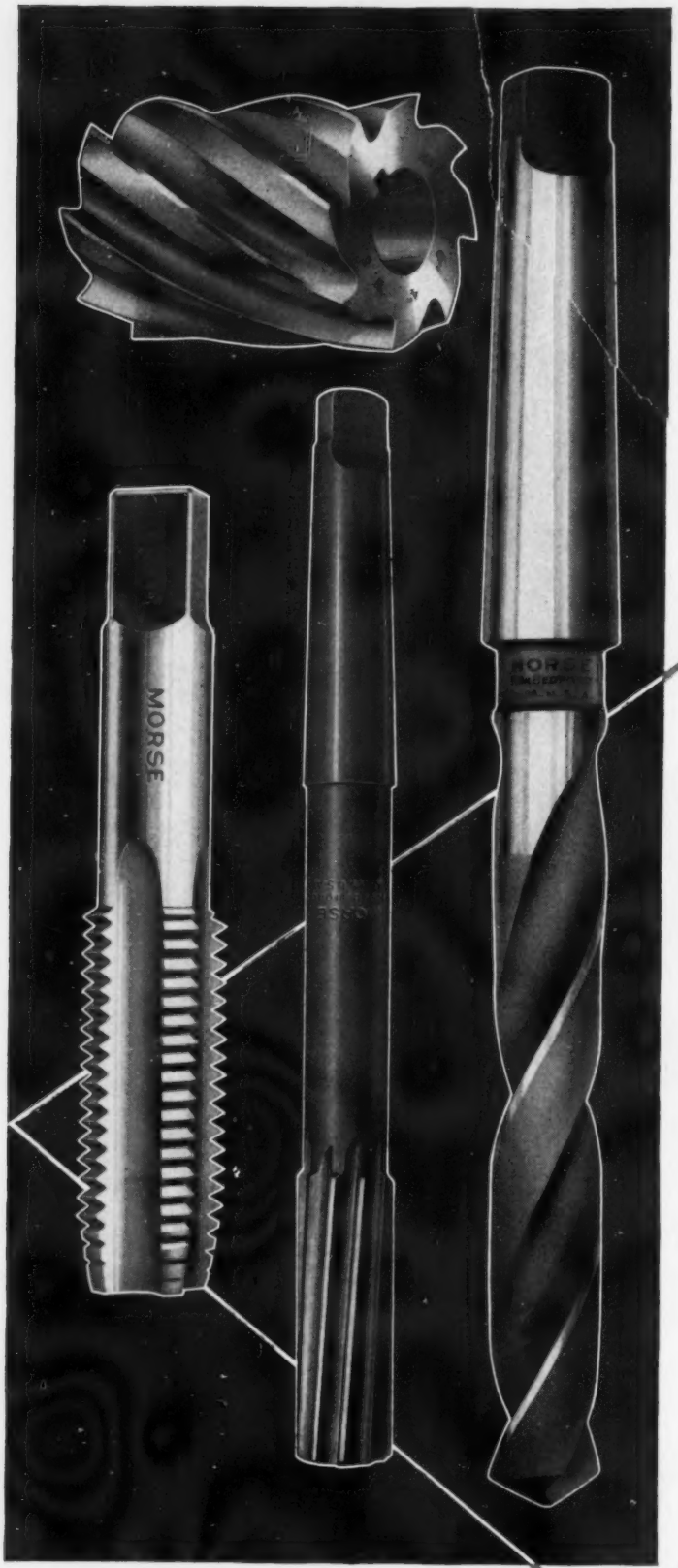
TWIST DRILLS
REAMERS, HOBS
MILLING CUTTERS
COUNTERBORES
SPECIAL TOOLS

TWIST DRILL AND TOOL COMPANY

HOME OFFICE AND FACTORY—DETROIT, MICH.

Tap and Die Division—Winter Brothers Co., Wrentham, Mass.

Factory Branches • New York • Chicago • Cleveland • San Francisco • Distributors in Principal Cities



PRODUCTION STRATEGY

• *It is good strategy* to use good cutting tools. The quality of your cutting tools measures the efficiency of your machine tools!

Ship worn-out High Speed Tools back to the steel mills – this high grade steel can do another war job.

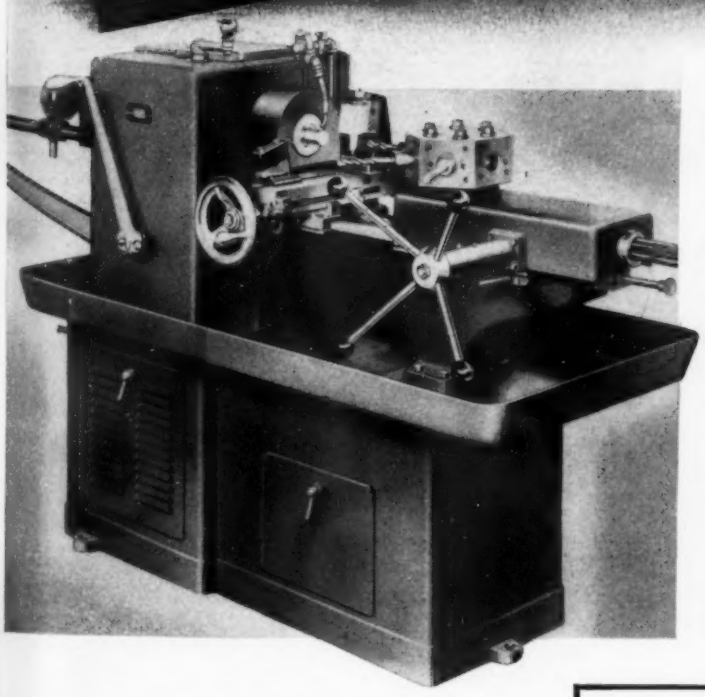
MORSE THERE *IS* A DIFFERENCE **TWIST DRILL AND MACHINE COMPANY**
NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. - - - - - CHICAGO STORE: 570 WEST RANDOLPH ST.

SIMPLICITY

of the Oster No. 601 RAPIDUCTION LATHE

Speeds Training of New Operators



Certainly you can't turn new operators loose on complicated machines. But you CAN relieve the pressure on their highly trained operators by diverting a wide variety of small diameter bar and chucking jobs to Oster No. 601 "RAPIDUCTION" Lathes.

This SIMPLIFIED machine is easy for the beginner to understand and operate efficiently after a short training period.

Ample proof of that statement is available. For example, one manufacturer has 139 Oster No. 601 Lathes operated mostly by people without prior machine shop experience.

For quick response to your request for complete details on the Oster No. 601 "RAPIDUCTION" Lathe, use convenient form below*.

No Time Out to Celebrate Our 50th ANNIVERSARY 1893-1943

OSTER

THE OSTER MFG. CO., 2049 E. 61st ST., CLEVELAND, OHIO, U. S. A.

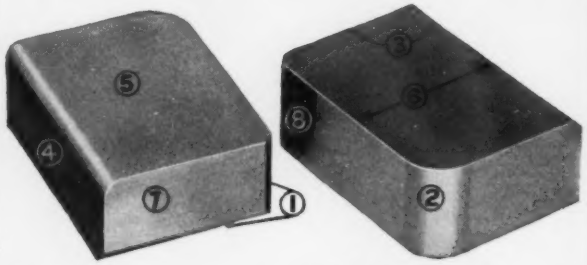
*O. K. Oster. We're interested in the No. 601 machine. ☐ Send Catalog No. 601. ☐ Ask your nearest distributor to see us at once. (Check either or both of above requests.)

NAME_____

ADDRESS_____

CITY_____ STATE_____

Faster on 8 Different Operations



1—chamfering
2—rounding
3—squaring
4—forming radii
5—grinding flat surfaces
6—grinding parallel surfaces
7—polishing
8—removes shaper marks

Vertical position of unit shown at right.

Model G-4 Surfacer—An ideal second-operation tool that takes the place of costly hand-filing or wheel-grinding. Women workers use it easily and confidently with no "machine fear" to slow them up.

PORTER-CABLE

Wet-Dry Belt Surfacers

for Speeding Tool Room Jobs

Just present the work to the abrasive belt, and this amazing new surfacing method chamfers, rounds, squares, forms radii, grinds flats and parallels, and secures high polish. All with an ease, precision and rapidity that makes this Porter-Cable machine one of the most useful to come out of today's drive for more speed on close-tolerance operations.

Applying millions of minute, diamond-hard abrasive points driven in straight lines at terrific speeds, the wet-belt method does in seconds what would normally require minutes. Used free-hand or with simple fixtures, it eases the load on hard-pressed millers, planers and shapers, handles more jobs, in greater variety, at savings quickly offsetting cost of the machine.

PORTER-CABLE MACHINE CO., INC.
1725-3 N. Salina St., Syracuse, N. Y.

5 to 50 Times Faster in Production

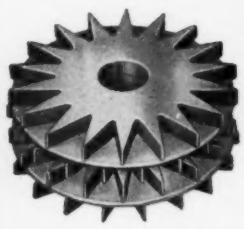
Even unskilled workers find Porter-Cable Belt Surfacers (Model G-8) easy and safe to use. Thus you get the double advantage of releasing your skilled workers for more important jobs as well as reducing operator cost per piece. Call the local Porter-Cable man (see classified 'phone book), or request new booklet showing many applications of belt surfacing.

ROTOREX GRINDER FOR ALL TOOLS

QUICK DELIVERY

Cylindrical Grinding Tap Grinding Internal Grinding

DOUGLAS MACHINERY CO. INC.
150 BROADWAY, NEW YORK, N.Y.



DESMOND

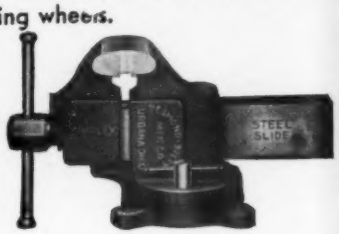
GRINDING WHEEL DRESSERS & CUTTERS

We manufacture a complete line of wheel truing tools and can supply the proper dresser for each of your grinding wheels.

SIMPLEX

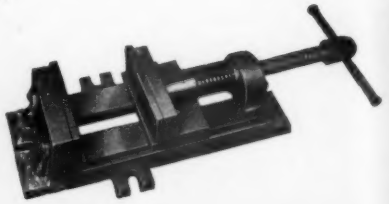
Steel Slide

VISES

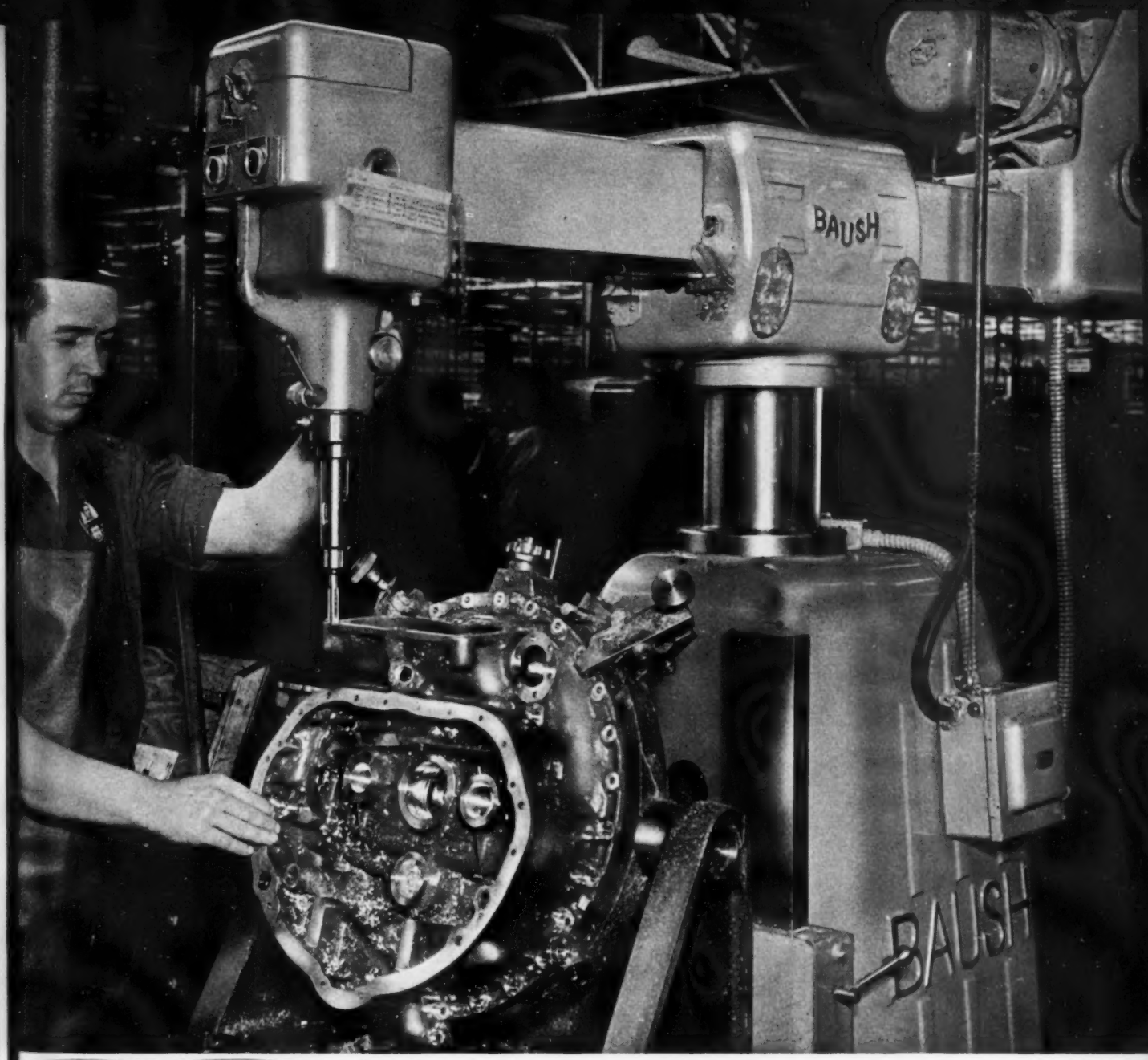


A full line of Machinists, Welders, Filers, Production and Drill Press & Milling Machine Vises with solid steel slides.

Write for copy of catalog "A" and name of your nearest dealer who can supply you.



THE DESMOND-STEPHAN MFG. CO.
URBANA, OHIO



BAUSH EQUIPMENT *helps build the "big 3"*

Packard-Rolls Royce,
Pratt & Whitney,
Wright Aeronautical
AIRCRAFT ENGINES

Speed tapping TO A CLASS 3 FIT

Baush Machine Tools are extensively used in the intricate, accurate, speedy manufacture of engines of war — for aircraft, for Navy and merchant ships, for the Army's mechanized equipment. Illustrated is one of these Baush Tools, the popular and efficient Precision Tapping Machine, set up in a mid-western plant for tapping on Pratt & Whitney aircraft engine parts. As set up above, seven holes are tapped around the carburetor pad . . six holes tapped inside carburetor pad . . six more tapped around a circular boss . . four in the selector valve pad . . **all tapped to a Class 3 fit!** Although production figures are confidential, it is obvious that Baush Precision Tapping Machines deliver outstanding performances.

Details on all Baush Machine Tools upon Request

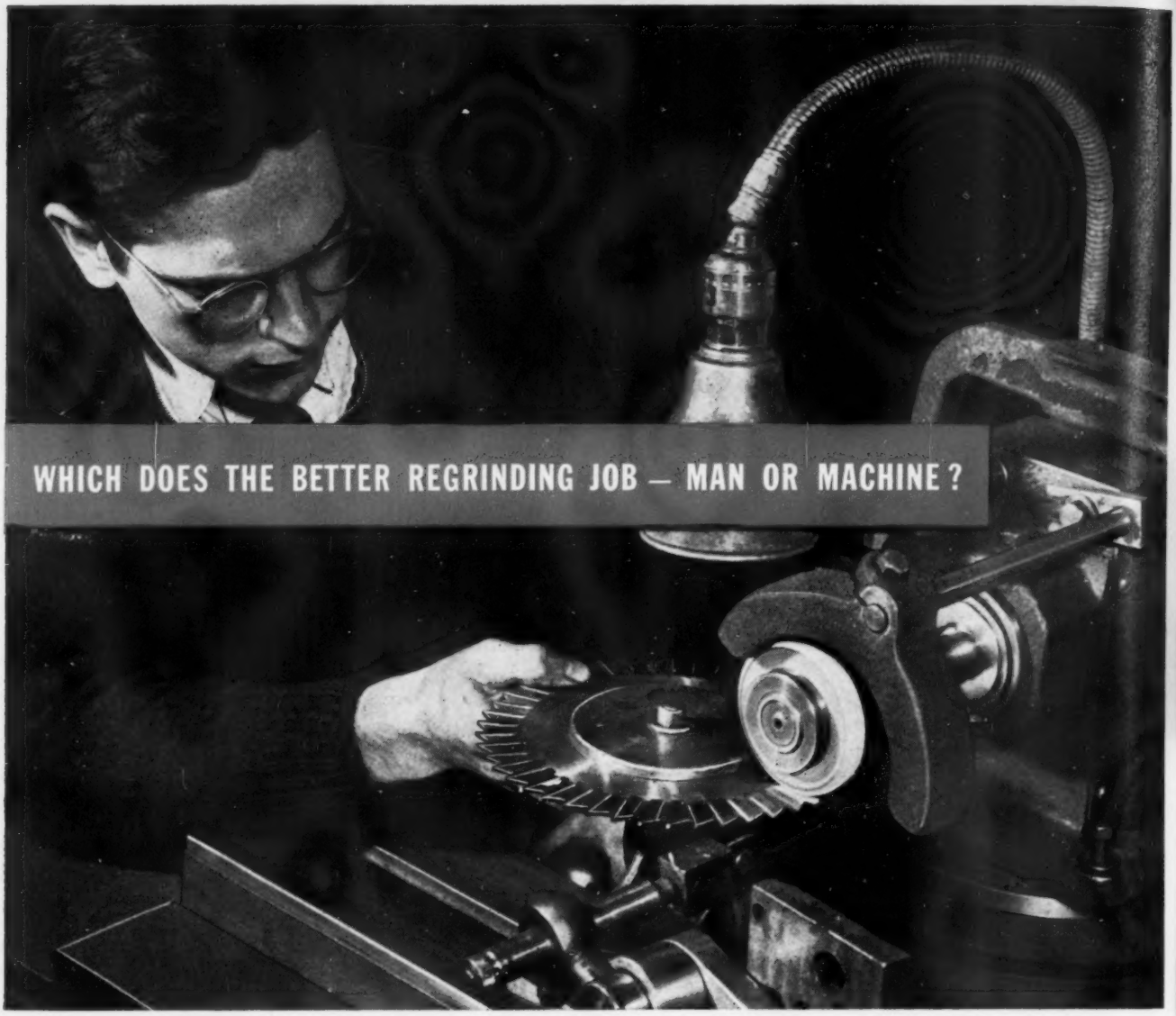
BAUSH

MEANS BUSINESS

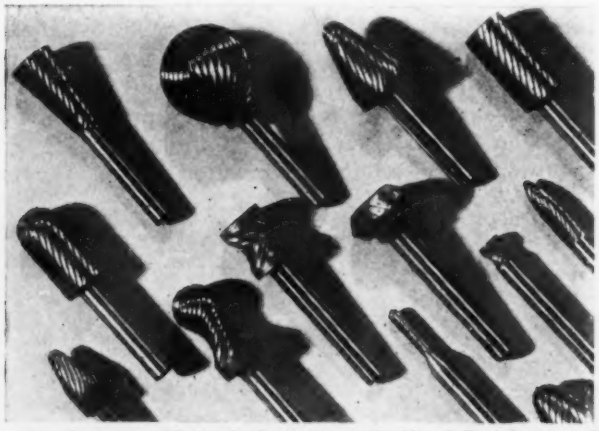
MACHINE TOOL COMPANY

SPRINGFIELD, MASS.

DETROIT, MICH.



Whether your dull cutters can be better reground by machine or by skilled craftsmen depends entirely upon the type of cutter—and the arrangement of its flutes. Here at Severance Tool we regrind thousands of cutters each day—some by machine and some by hand. Regardless of the type of tools you send us, we are manned and equipped to regrind them by the method that does the job best. After regrinding we further improve your tools by the new Severite heat-treat process which hardens the teeth of your cutters and increases their life from two to five times.



Severance Regrinding Service, 1) Saves tool steel by making worn cutters as good as new, 2) Saves your production time by returning your renewed tools within 72 hours of the time they are received, and 3) Saves money because Severance regrinding costs only a fraction of original new tool price. Write today for "Regrind Toollog" fully describing our regrinding service.

Severance

MIDGET MILLING CUTTERS • PRECISION REGRINDING
SEVERANCE TOOL INDUSTRIES, INC., SAGINAW, MICH. • PLANTS IN LONG ISLAND CITY, N.Y.; DETROIT, MICH.; FORT WAYNE, IND.; CHICAGO; AND LOS ANGELES

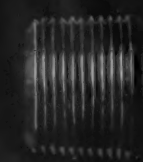
See Severance Display in Booth 65 at Machine & Tool Progress Exhibition in Milwaukee, Wisconsin Auditorium March 25, 26 and 27

CAN YOU CUT *Pressure Tight Threads* WITH YOUR DIE HEADS?

This One Does!

BRASS

MONEL



FORGING

ALUMINUM

If you've worked to the new threading specifications for PRESSURE TIGHT pipe fittings (used by the Army and Navy for S.A.E. fuel lines, hydraulic oils, refrigerants) your inspectors know that meeting the usual precision limits of American Pipe Threading Standards is easy, by comparison.

Plants that specialize in millions of these closer limit fittings also specialize in Namco Self Opening Dies with circular ground thread chasers because:

- ✔ **1. Circular chasers are ground exactly to the closest tolerances required — gauge accuracy;**
- ✔ **2. When Namco die heads open at end of the cut, the chaser holding blocks drop smoothly off from positive cams — no drag, no shave, no tell-tale marks;**
- ✔ **3. The closest gauges used for checking pitch, lead, form and taper, prove that these tools will meet and hold not part but ALL of these essentials — on long production runs.**

If you have pressure tight threads to cut, or any other out-of-the-ordinary threading problems, put it up to Namco Circular Chaser Dies.

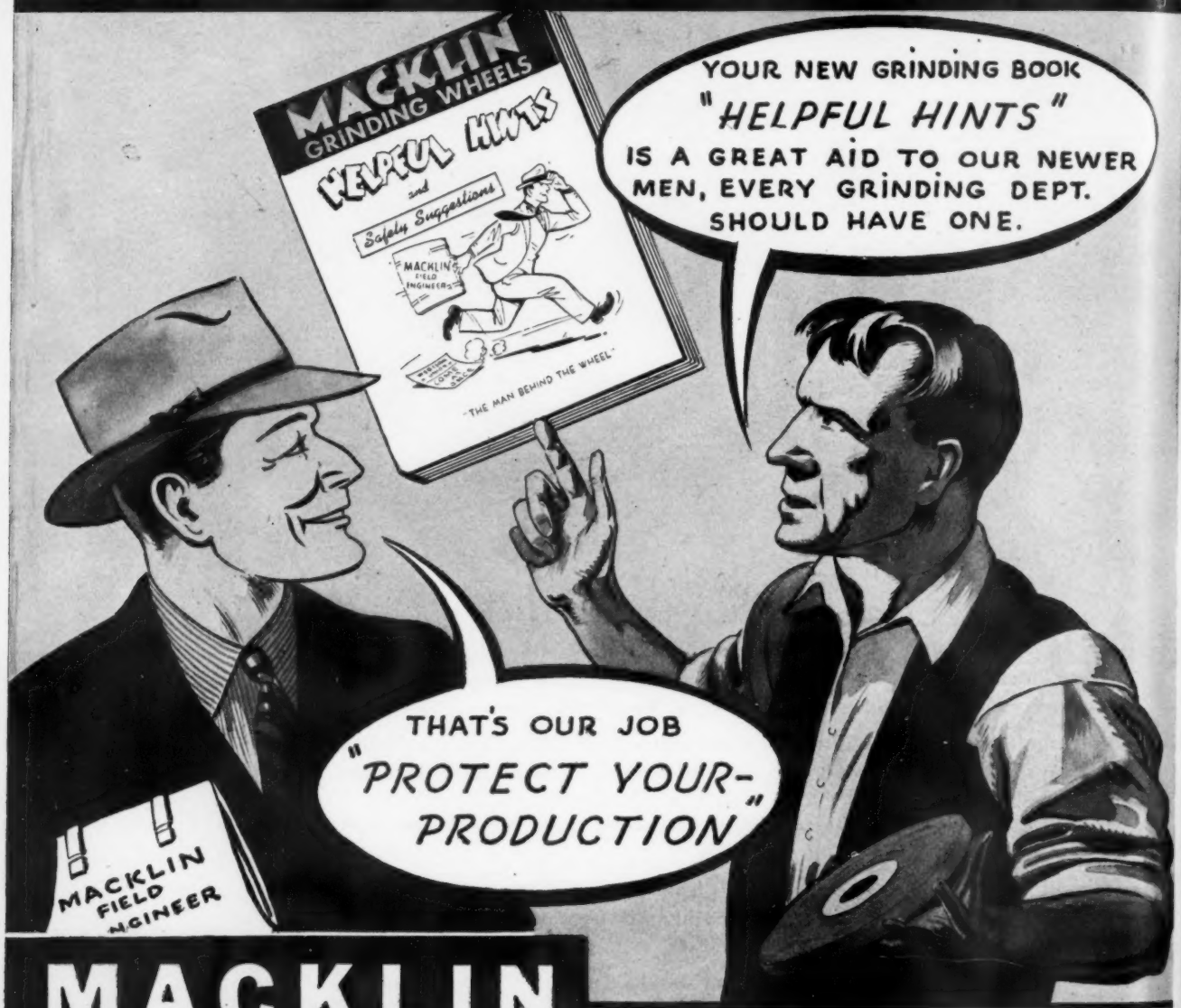
Catalog D-42 explains "why" in detail.

THE NATIONAL ACME CO.

170 EAST 131ST STREET • CLEVELAND, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • SCREW MACHINE PRODUCTS • THE CHRONOLOG • LIMIT SWITCHES • POSITIVE CENTRIFUGE • CONTRACT MANUFACTURING

MACKLIN GRINDING WHEELS


MACKLIN
GRINDING WHEELS
HELPFUL HINTS
and
Safety Suggestions
MACKLIN FIELD ENGINEER
"THE MAN BEHIND THE WHEEL"
YOUR NEW GRINDING BOOK "HELPFUL HINTS" IS A GREAT AID TO OUR NEWER MEN, EVERY GRINDING DEPT. SHOULD HAVE ONE.
THAT'S OUR JOB "PROTECT YOUR-PRODUCTION"
MACKLIN FIELD NGINEER

MACKLIN COMPANY

Manufacturer of Grinding Wheels

JACKSON, MICHIGAN, U. S. A.

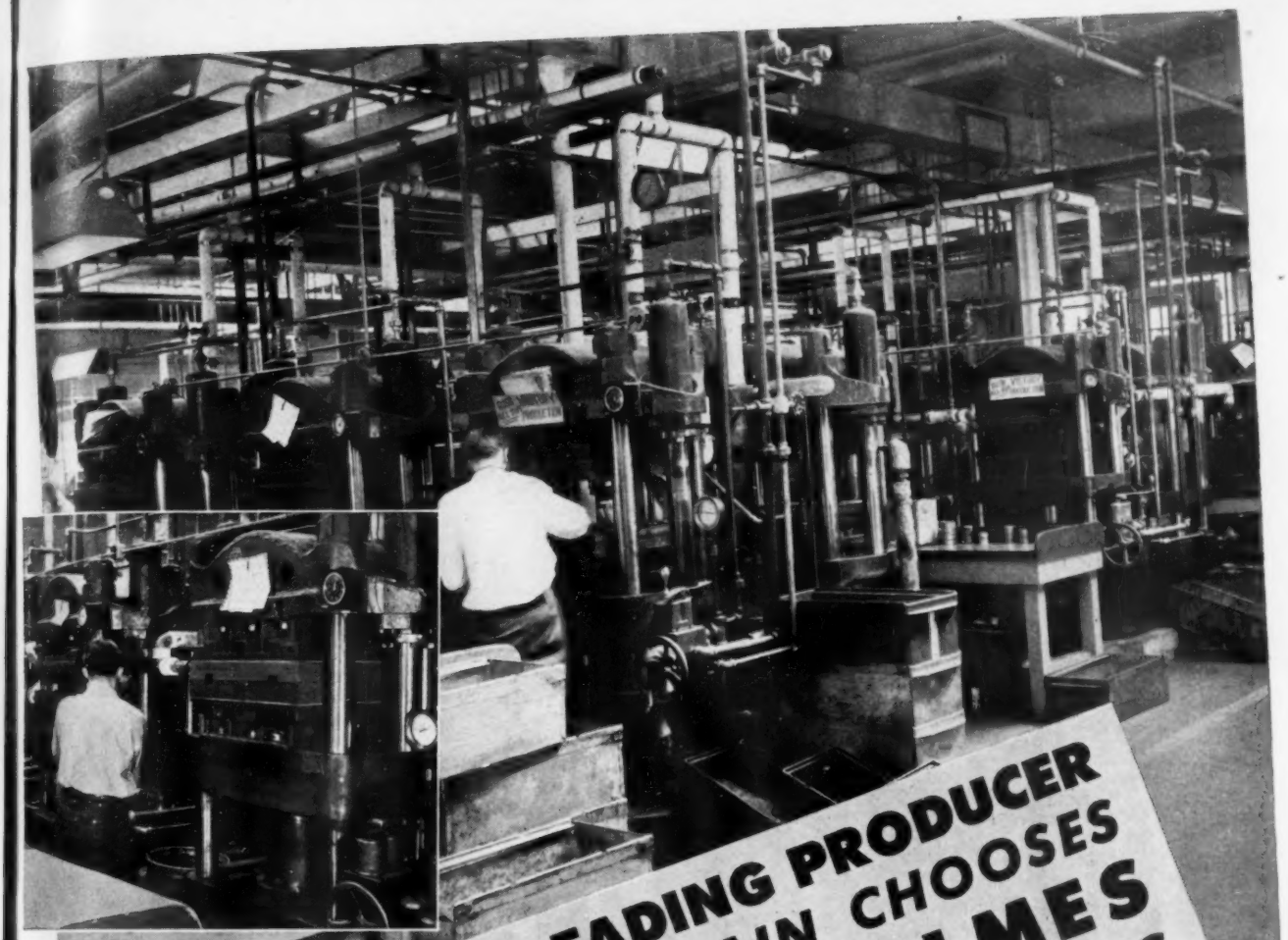
Sales Offices

CHICAGO - NEW YORK - DETROIT - PITTSBURGH
CLEVELAND - CINCINNATI - MILWAUKEE
PHILADELPHIA

Macklin Grinding Wheels are made in all sizes and shapes for every type of grinding job. No matter what your grinding problem may be there is a Macklin wheel that will show cost saving results and "Protect Your Production." Ask for the services of a Macklin Field Engineer—no obligation.

If you use grinding wheels write for Macklin's new 64 page book "Helpful Hints and Safety Suggestions." To such requests on business stationery this book will be mailed free. Address

MACKLIN COMPANY
Dept. S
JACKSON, MICHIGAN



Another LEADING PRODUCER AGAIN CHOOSES ELMES PRESSES

. . . to make quality molded products faster. This installation of Elmes Hydraulic Presses began in a small way; repeat orders have expanded it into this large battery.

This example is typical of many manufacturers who have regularly reordered Elmes Presses, based on performance. The success of Elmes Presses is due to: (1) Long Experience (2) Proper design (3) Precision manufacturing (4) Rigid inspection and (5) Conscientious service to customers. Elmes builds metal working presses, plastic molding presses, extrusion presses, pumps, accumulators, valves and accessories.

Elmes engineers will cheerfully study your hydraulic power problems and make suggestions. Why not write them today?

SINCE 1851

Elmes

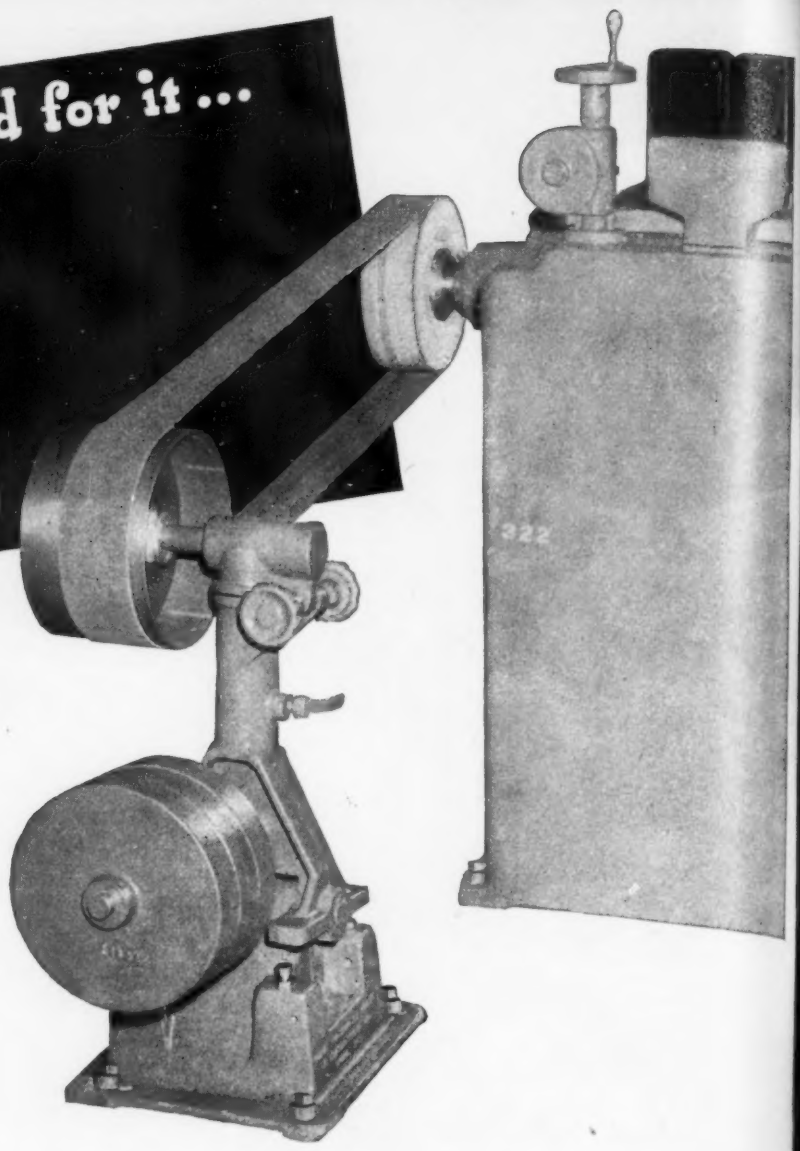
HAYMARKET 0696

CHARLES F. ELMES ENGINEERING WORKS
OF AMERICAN STEEL FOUNDRIES
1001 FULTON STREET • CHICAGO, ILLINOIS

Also Manufactured in Canada:
WILLIAMS & WILSON, Ltd., Montreal & Toronto—*Distributors in Central and Eastern Canada* . . . . GORDON RUSSELL, Ltd., Vancouver—*Distributors in Western Canada*

METAL WORKING PRESSES • PLASTIC MOULDING PRESSES • EXTRUSION PRESSES • PUMPS • ACCUMULATORS • VALVES • ACCESSORIES

Don't take our word for it ... read what PRODUCTION MEN say about IDLER BACKSTANDS



"Eighty instead of former twenty on set-up wheels."
Large metal battery cases for the Navy.

"Greatly increased production; definitely better finish."
Grinding the welds and putting a radius on corners of stamped steel cartridge boxes.

"More than five times former production."
Removing outside flash from parachute hardware.

"Over five times the former output from set-up wheels."
Sanding stainless steel tubes very similar to 37 mm. shell cases.

"Increased production four to one."
Removing brazing metal on slender steel tubing.

"Excellent finish and increased output."
Aluminum and bronze castings.

Among the outstanding advantages gained by many war industries through adopting Idler Backstands and Metalite Cloth belts, we list but a few:

Controlled coating of modern abrasive cloth.
Faster heat dissipation—more cutting surface.
Range of grit sizes available—15.
Speed of belt changes.
Reduced loss of abrasive grain.
Retention of desired cushion in contact wheel.

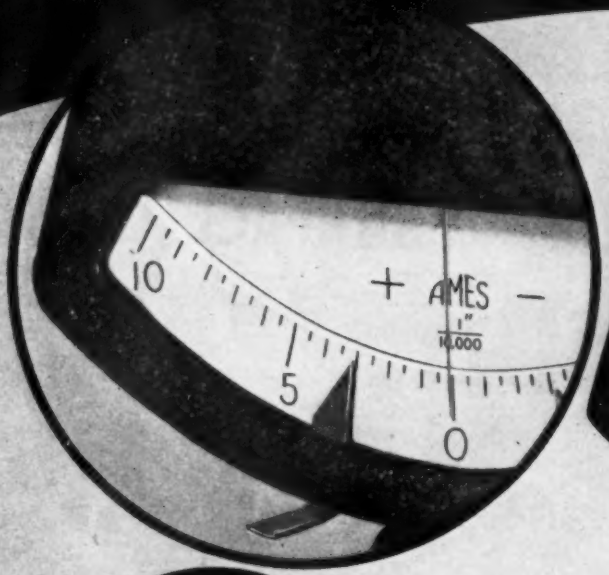
And the change-over to a Backstand is made so quickly, so easily, so inexpensively, ***you can't afford not to investigate.*** One of our Field Engineers will give you the fullest help.

Write Us or Phone a Nearby Branch:—*Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Grand Rapids, High Point, Indianapolis, Los Angeles, New York, Philadelphia, St. Louis, San Francisco, Tacoma.*

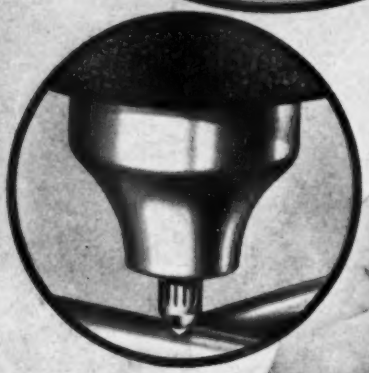
Maximum CUT Minimum COST QUALITY ABRASIVES

BEHR-MANNING · TROY, N. Y.
(DIVISION OF NORTON COMPANY)
QUALITY COATED ABRASIVES SINCE 1872

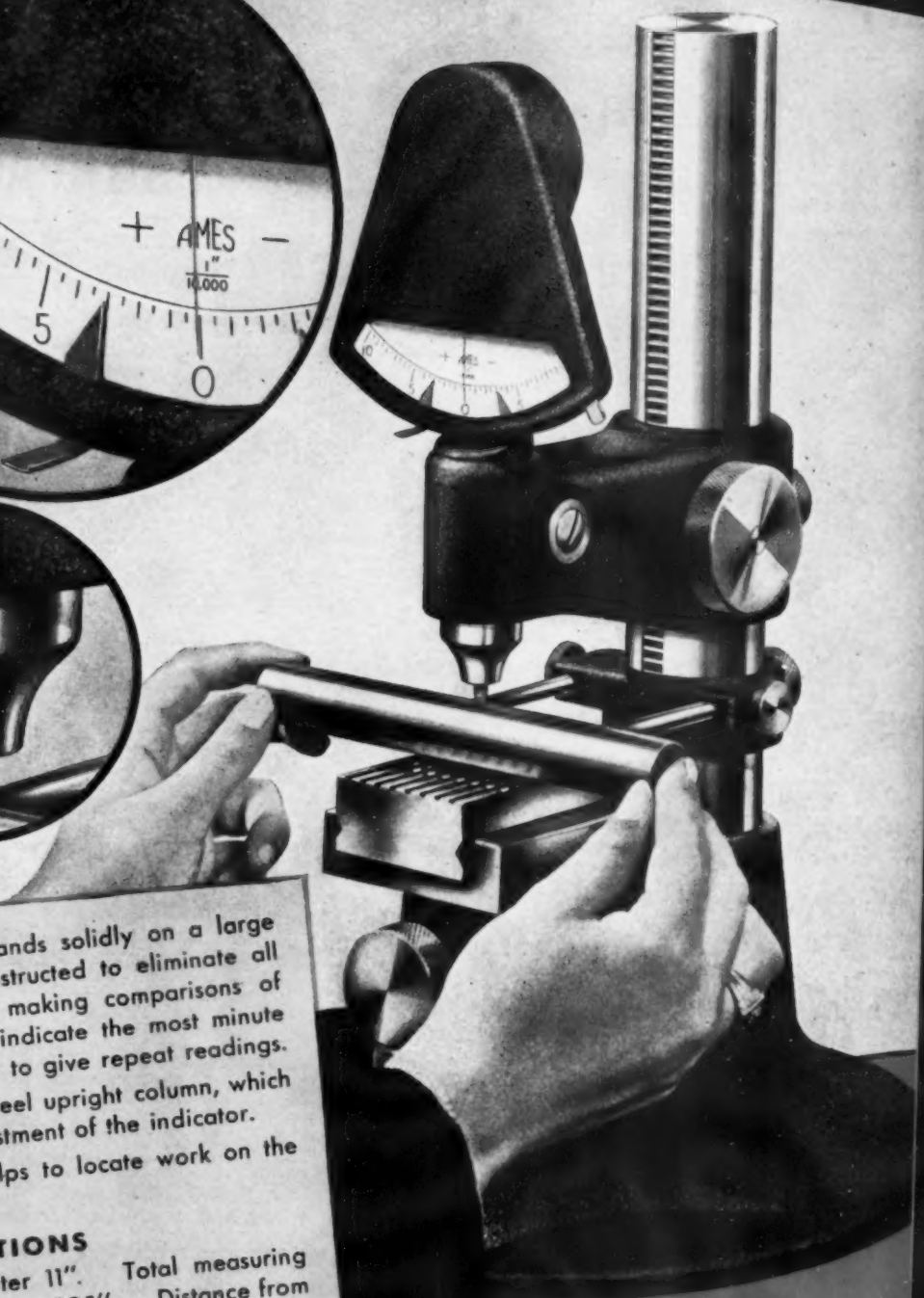
AMES AMPLIFYING COMPARATOR No. 26



fan shaped indi-
or has a total spin-
travel of 2/1000",
ving a measuring
pacity of 1/1000"
us and 1/1000"
us from zero. With-
this limited range
accuracy is held
.00001".



mond Point re-
es wear to a min-
m, giving thou-
ds of successive
urate readings.



This precision built Comparator stands solidly on a large diameter base and is heavily constructed to eliminate all spring. It is intended for use in making comparisons of duplicate parts for size and will indicate the most minute variations on the dial, with ability to give repeat readings. The cast iron base supports the steel upright column, which has a rack for up and down adjustment of the indicator. The adjustable stop assembly helps to locate work on the hardened and ground anvil.

SPECIFICATIONS

Total height 15". Base diameter 11". Total measuring capacity 6". Indicator total range .025". Distance from contact to front of Post 3½". Anvils 2⅛" x 3¼". Special anvils to order. Diamond contact point. Light pressure. Approximate weight 40 pounds.

Send for bulletin COMP. 102

(Above) Checking Size to .0001" or l

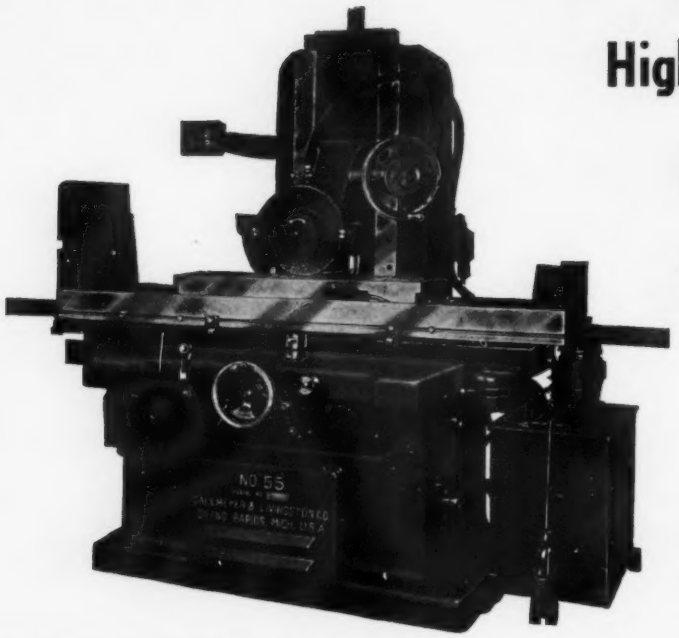
PROMPT DELIVERY

Manufactured By **B. C. AMES CO. • WALTHAM, MASS., U. S. A.**

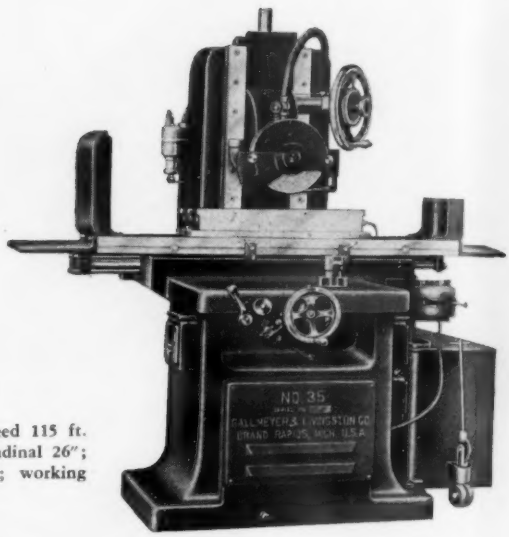
Branch Offices: 423 New Center Bldg., Detroit, Mich. • 420 Lexington Ave., New York, N. Y.

Grand Rapids

High Speed—Precision Type
HYDRAULIC FEED SURFACE GRINDERS



No. 55 maximum longitudinal table speed 125 ft. per min.; automatic table travel, longitudinal 38″; automatic table travel, transverse 13½″; working surface of table 12″ x 36″.



No. 35 maximum longitudinal table speed 115 ft. per min.; automatic table travel, longitudinal 26″; automatic table travel, transverse 9¼″; working surface of table 8″ x 24″.

SMOOTH · FAST · CONVENIENT
for TOOL ROOM or PRODUCTION LINE

Grand Rapids High Speed Hydraulic Feed Surface Grinders embody design, construction and operating features that have been developed over a period of thirty-six years of specialization in the development of fine quality surface grinding machines.

These units offer the maximum in speed and smoothness. In addition to the two sizes shown, they are built in the following models and automatic longitudinal table travels: No. 25-20″; No. 38-38″; No. 45-26″ and No. 65-50″.

Features include the massive, sturdy "Grand Rapids" one-piece column and base—a construction which assures absolutely permanent alignment of cross travel and upright head ways.

Whatever your tool room or production surface grinding problem, it will pay you to get in touch with "Grand Rapids." Outline your requirements and you can be assured of our assistance.

Send for Bulletin GL 100 giving detailed specifications of "Grand Rapids" High Speed Precision Type Hydraulic Feed Surface Grinders.

GALLMEYER & LIVINGSTON CO.
330 STRAIGHT AVE., S.W. GRAND RAPIDS, MICHIGAN

WE'VE WORKED TOGETHER TO WIN THIS "E"

It's our war, too. We're all proud to be doing the kind of job that merits the "E".

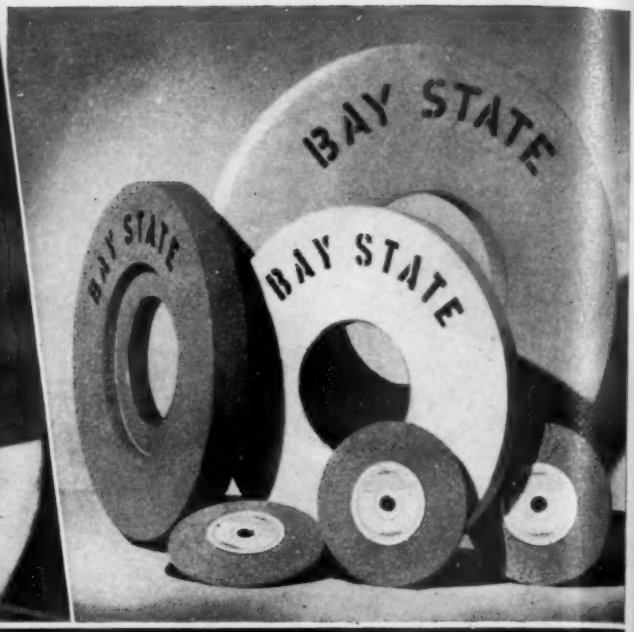
We women in the Detroit Broach plant are going to do our part in adding stars to this flag.

It has been—and will continue to be—our responsibility to make this "E" stand for "Excellence in Engineering", too.

The "E" and the "Bullseye" on our flagstaff! I'm happy to have had the privilege of helping to win both.

Four Detroit Broach employees—thoroughly typical of the entire organization. They have done their jobs well . . . they have earned the honor to wear the Army-Navy "E". It is the combined efforts of men and women like these that will continue to increase American production . . . that will guarantee our ultimate and complete Victory.

DETROIT BROACH COMPANY 20201 Sherwood Avenue Detroit, Michigan



THEY'RE DOING A "SWELL" JOB!

. . . and "hats off" to women operators like these and thousands of others who have stepped into industry to help fight this war!

Our superior allied battle-front action is dependent to no little degree on the skill and courage of our women on the production line. Long will we remember their great contribution.

BROACH GRINDING

Photos courtesy of LaPointe Machine Tool Co.

BAY STATE

ABRASIVE PRODUCTS CO., WESTBORO, MASS. U.S.A.

MAKING EACH HOUR A MORE *Productive* ONE····

Model "THTF-L-6" Center Control 6000 Pound Capacity Telescopic Tilting Tiering Fork Lift Truck for Unit Loads on Pallets or Skid Platforms Standard Forks up to 36" long. Telescopic Lift up to 119"

Model "THTF-L-4" Center Control 4000 Pound Capacity Telescopic Tilting Tiering Fork Lift Truck for Unit Loads on Pallets or Skid Platforms Standard Forks Up to 36" Long. Telescopic Lift Up to 119"

TRANSPORTER PALLET TYPE TRUCKS

Model "P-427" Pallet Type 4000 Pound Capacity "TRANSPORTER" Fork Type Lift Truck. Standard Established Fork Lengths Are Minimum 30" to 60" Maximum in 2" Steps. Standard Fork Height In Low Position is 3⅜", Lifting Height from Low to High Position is 3⅜" (Get P-427 Bulletin for Full Details).

PLATFORM TYPES

Model "TN-4 and TW-4" 4000 Pound Capacity and Model "TN-6 and TW-6" 6000 Pound Capacity "TRANSPORTER" Platform Type Lift Trucks for Skid Platforms—Standard Platform Lengths 36" to 72" in 12" Steps. Widths 20" and 26½"; Heights In Low Position 6"; 7"; 9"; 11"; (For Full Details Get "TRANSPORTER" Platform Bulletin).

TRADE AUTOMATIC MARK *Standard* VICTORY MODELS

NOTE: Some "AUTOMATIC" approved models can be furnished with specifications meeting "Industrial Truck Association Spark-Enclosed Equipment" for operation in heavily laden dust or vapor atmosphere such as in arsenals, ammunition depots, and ordnance or chemical warfare plants. These are models "LN-2"; "TLN-2"; "THTF-L-4"; "THTF-L-6"; and "TRANSPORTER" platform and pallet type lift trucks.

Each "AUTOMATIC" Approved Standard VICTORY Model will have the same time-proven features, quality materials, precision workmanship, sturdy construction, and guarantee under which the entire line of "AUTOMATIC" has already won wide industrial acceptance for highly efficient and economical materials handling.

"AUTOMATIC" is ready to serve you now as always without obligation through nationwide Material Handling Representatives who are fully experienced in the application of "AUTOMATIC" equipment. These men are listed in the classified telephone directories in the principal cities and industrial areas under "Trucks, Industrial." In many instances proper planning and co-ordination now with standardized equipment for war production will serve you efficiently for post war activity.

All models are approved types to conserve vital materials and speed up war production materials handling

- Model "TLN-2" 4000 Pound Capacity High Lift Tiering Platform Truck for Skid Transportation and Stacking.
- Model "TLN-3" 6000 Pound Capacity High Lift Tiering Platform Truck for Skid Transportation and Stacking.
- Model "LN-2" 4000 Pound Capacity Low Lift Elevating Platform Truck for Skid Transportation.
- Model "LO-5" 10,000 Pound Capacity Low Lift Elevating Platform Truck for Skid Transportation.
- Model "LN-3" 6000 Pound Capacity Low Lift Elevating Platform Truck for Skid Transportation.
- Model "THTF-M-10" Heavy Duty Center Control 10,000 Pound Capacity Telescopic and Non-Telescopic Tilting Tiering Fork Lift Truck for Unit Loads on Pallets or Skid Platforms.
- Model "TETF-7" Rear Control 7000 Pound Capacity Telescopic Tilting Tiering Fork Lift Truck for Unit Loads on Pallets or Skid Platforms.
- Model "TLO-5" 10,000 Pound Capacity High Lift Tiering Platform Truck for Skid Transportation and Stacking.
- Model "CHTF-2" Center Control-Light Duty 2000 Pound Capacity Telescopic Tilting Tiering Fork Lift Truck for Unit Loads on Pallets or Skid Platform.

MANUFACTURERS FOR OVER 35 YEARS *Electric Propelled* INDUSTRIAL TRUCKS

AUTOMATIC TRANSPORTATION CO.

DIV. OF THE YALE & TOWNE MFG. CO.

59 WEST 87th STREET CHICAGO, ILLINOIS

WARTIME, PEACETIME—KEEP 'EM CUTTING *The Wells Way!*

WELLS No. 8

Wells SAWS
THE SIGN OF SERVICE

THE SAW WITH THOUSANDS OF FRIENDS IN INDUSTRY!

A fast and accurate metal cut-off saw able to handle most all types of metals in various shapes and forms as applied to industry. It wanted a versatile, simple unit for odd jobs or production work. The Wells No. 8 was the answer — and that is why so many plants, large and small, have Wells Saws.

Today's war production program and tomorrow's peace-time competition will emphasize the advantages Wells Engineers have built into their products. If you have metal cutting problems look for the answer in a Wells. Call your distributor or write direct.

Wells Has Established Leadership

SPECIFICATIONS

WELLS No. 8

Capacity: Rectangle..... 8" x 16"
(spec. bowed guides)... 5" x 24"
Rounds ..... 8" dia.
Speeds: ft. per min. 60, 90, 130
Motor..... Specifications optional

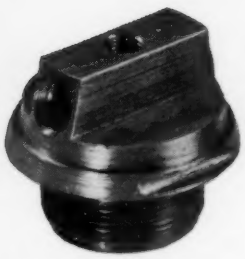
WELLS No. 5

Capacity: Rectangle... 5" x 10"
(spec bowed guides)
Rounds ..... 5" dia.
Speeds: ft. per min. 60, 90, 130
Motor: .... Specifications optional

WELLS MANUFACTURING CORPORATION

Wells METAL CUTTING BAND SAWS

505 ROOSEVELT ROAD • THREE RIVERS, MICHIGAN



BEFORE BRUSHING

AFTER BRUSHING
(All burrs removed and corners broken)

Brushing Wheels

Gang Up to Speed Shell Production

ON their way through this automatic machine are some small metal pieces which shortly will be part of the delicate timing devices in shells.

To insure positive, accurate explosion of the shell, these parts must be finished to precision tolerances. To enable the fastest possible assembly, all burrs, metallic fuzz and sharp edges—"friction points" left by previous machining operations—must be eliminated.

These parts were, and are, needed by the millions, but the specifications for meticulous finishing threatened to be a bottleneck so tight that actual production would be cut to a trickle of a few hundred a day.

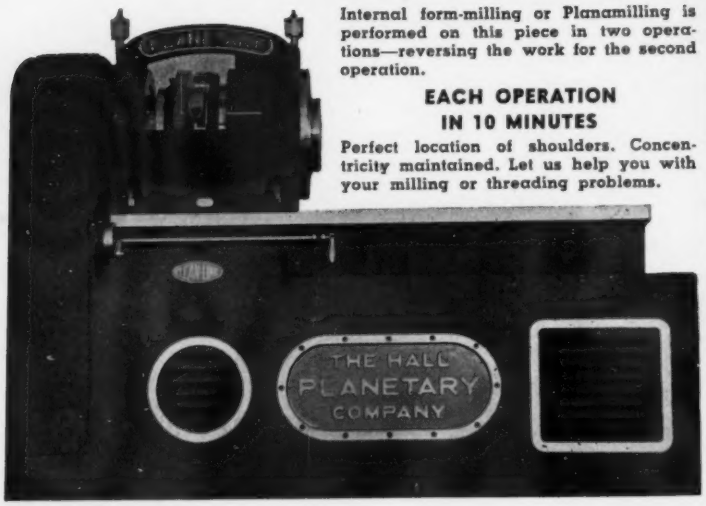
How to get quality *and* quantity? One of the companies face to face with this problem had an Osborn Brushing Specialist analyze the job. He found that a combination of three Osborn Brushing Wheels, the Master Wheel, Disc-Center Section and "Fascut" Tampico Section, would do it, but in view of the tremendous quantities of identical pieces to be finished he also recommended using an automatic machine capable of 1200 to 1500 pieces per hour.

Now the threatened trickle is a river of accurate, finely finished shell parts, easy to assemble and positive in action. The services of the Osborn Brushing Specialist in your district are available to war plants for the asking. For help on specific burring, cleaning and finishing problems or for an O. B. A. (Osborn Brushing Analysis) of war-essential operations, get in touch with him today, through *The Osborn Manufacturing Company, 5401 Hamilton Avenue, Cleveland, Ohio.*

Osborn Brushes

WORLD'S LARGEST MANUFACTURER OF
BRUSHES FOR INDUSTRY

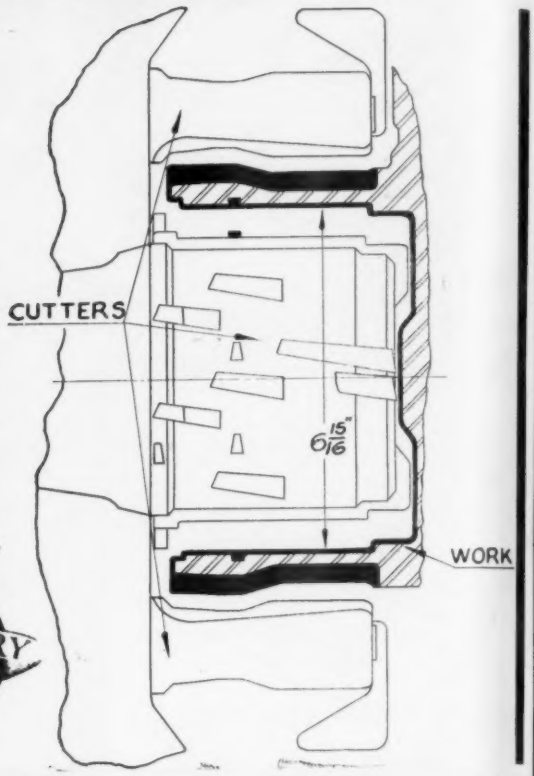
★ PLANAMILLING ★

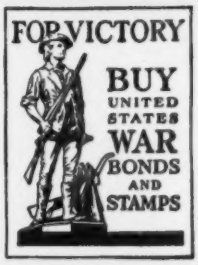


Internal form-milling or Planamilling is performed on this piece in two operations—reversing the work for the second operation.

EACH OPERATION IN 10 MINUTES

Perfect location of shoulders. Concentricity maintained. Let us help you with your milling or threading problems.





The HALL PLANETARY COMPANY

Fox St. & Abbotsford Ave.

Philadelphia, Pa.

A Powerful Suction is Important

There is no chance for grinder dust to damage human lungs and work as an abrasive on expensive equipment when it is trapped the instant it leaves the wheel.

The powerful fan of the Air Master surely and quietly draws harmful grit of grinding and buffing wheels into filter bags - - keeps it out of the air. There's a size for every wheel. Easy to install, easy to clean.

Write today for descriptive literature.

The Cincinnati

ELECTRIC DRILLS • GRINDERS • BUFFERS • PORTABLE TOOLS

The Cincinnati Electrical Tool Co.

DIVISION OF THE R. K. LE BLOND MACHINE TOOL CO., CINCINNATI, OHIO

3909-3 MADISON RD

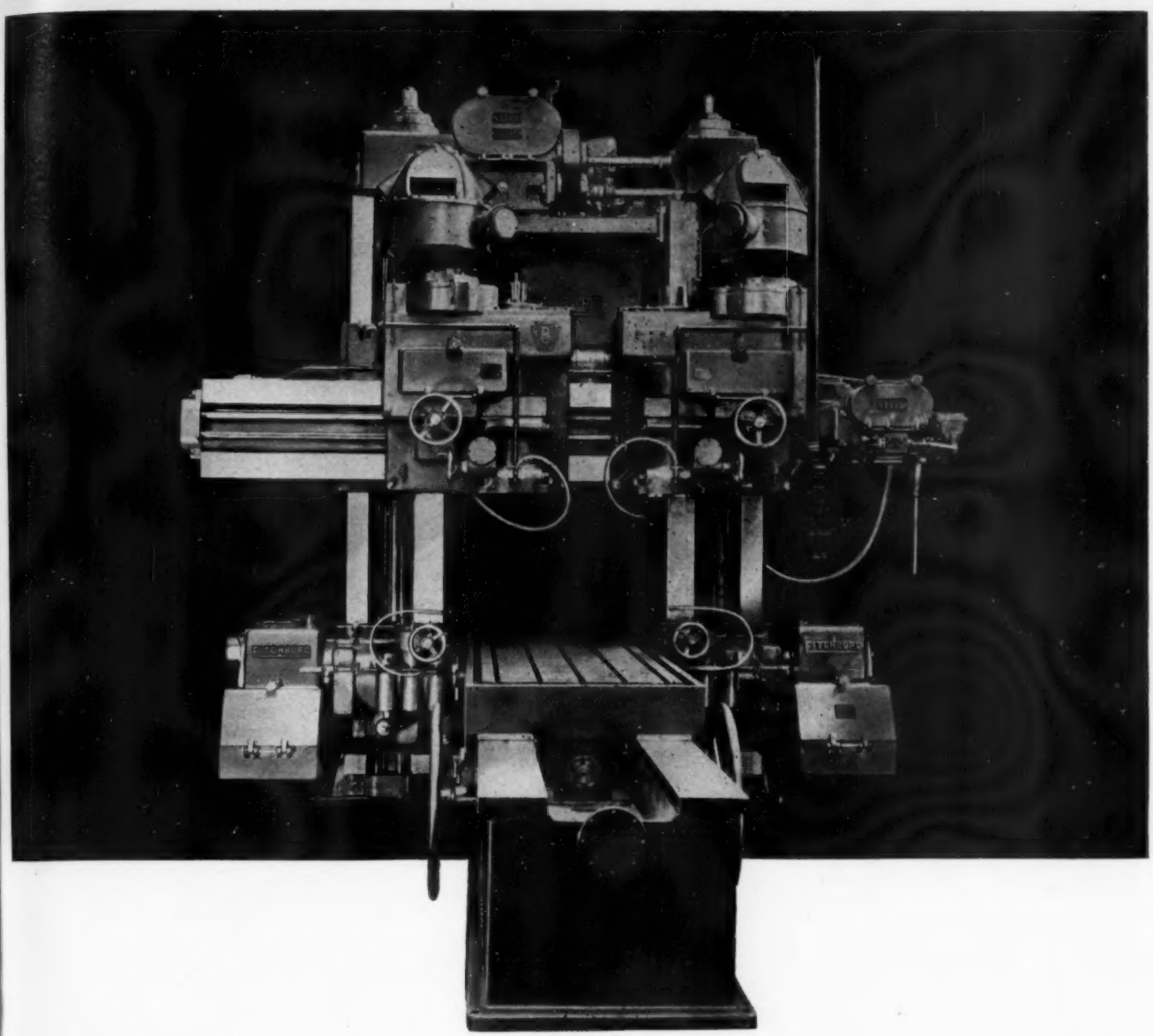
Characteristic of the design of all STURDIMATIC LIVE CENTERS is a low overhang and a slight cushioning action . . .
that compensates for expansion due to heat, shock and excessive thrust loads—reducing wear to a minimum. A properly engineered live center is one of the fundamentals of setting up a job and requires a specialist's experience . . . standard shanks with Morse taper carried in stock.

Send us your specifications and blueprints—We will see that your job is set up with the right LIVE CENTER—prompt deliveries on high priorities.

STURDIMATIC

TOOL COMPANY

5214 THIRD AVE. DETROIT, MICH.



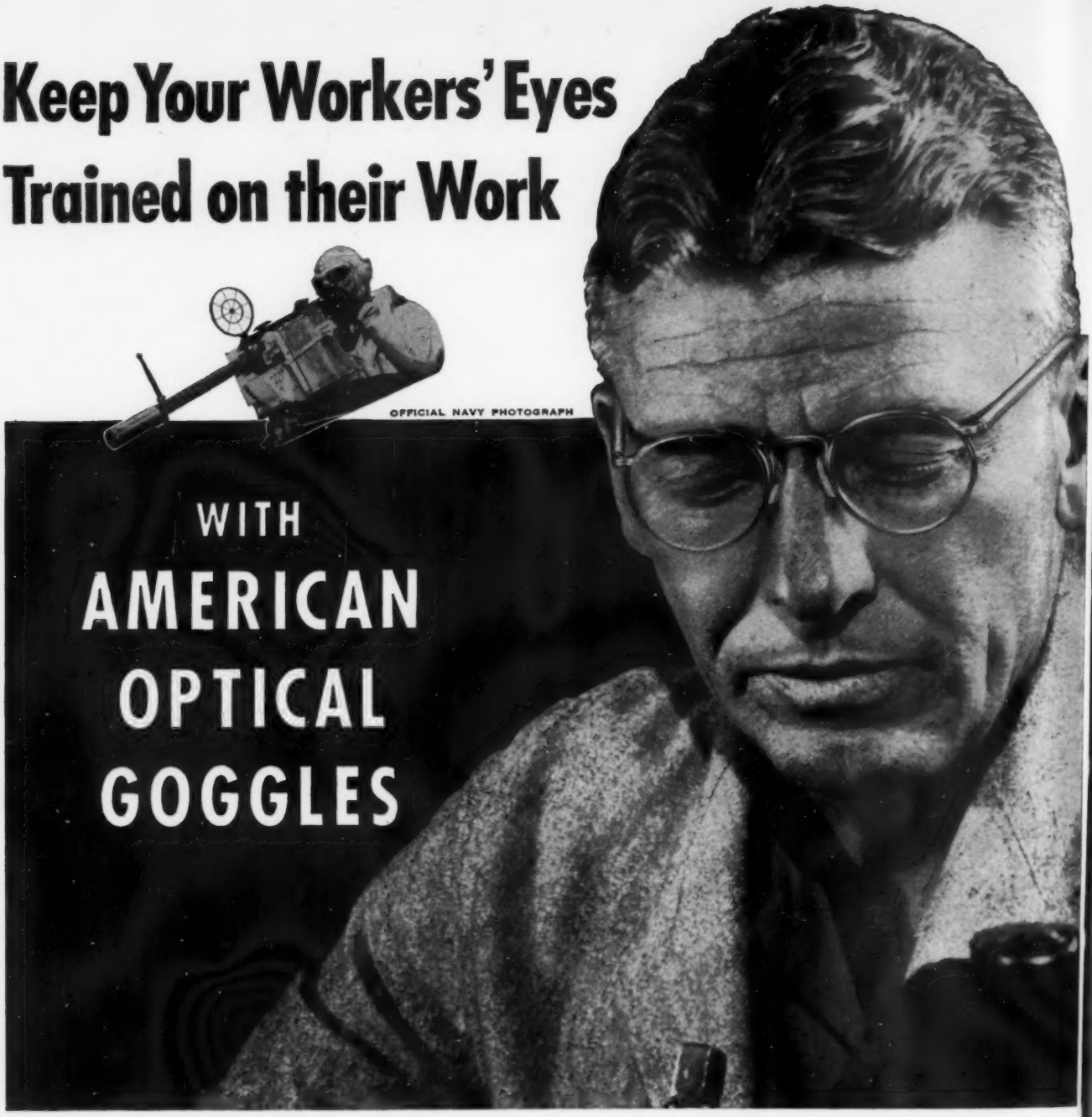
FITCHBURG PLANER TYPE MILLER

Fitchburg 4-head planer type milling machine equipped with four 5″ milling heads. Width of table 36″, distance between uprights 44″, length of table 12 ft. Feed to table by screw suspended in fully enclosed Timken bearings, driven through mechanical gear box. Heads have feed and rapid traverse horizontally on cross rail and vertically on uprights. Rail has vertical feed and traverse. Rail is hydraulically clamped from operator's position. Six of these machines furnished to a large electrical manufacturer.

FITCHBURG ENGINEERING CORPORATION

FITCHBURG, MASSACHUSETTS

Keep Your Workers' Eyes Trained on their Work



WITH AMERICAN OPTICAL GOGGLES

We need more than our workers' hands to win this war . . . we also need their *eyes*. Yet, for lack of proper goggles, industrial eye accidents are *still* occurring at an alarming rate . . . *still* costing our valiant fighting men much equipment that they need to smash the enemy.

Put on an offensive now to stop eye accidents in *your* plant. American Optical Company, pioneer manufacturer of products to aid and preserve vision, offers you the eye protection equipment and complementary services that your plant needs to protect man-power for war-power. AO Goggles are scientifically designed to give maximum possible protection . . . and workers find them comfortable to wear. Have your Safety Director get in touch with the nearest American Optical Branch Office.

American Optical
COMPANY
SOUTHBRIDGE, MASSACHUSETTS

NOW IN STOCK

NATIONAL FINE
NATIONAL COARSE
No. 0—80 to 1″—8
and
PIPE PLUG GAGES
⅛ to ½

CADILLAC
THREAD PLUG GAGES

By concentrating our greatly increased capacity on standard National Fine and National Coarse Thread Plug Gages, we are able to offer these from stock for immediate delivery. Let us serve you ... orders and re-orders from the nation's largest armament manufacturers testify to the accuracy of CADILLAC Gages.

Reasonable delivery on Standard Rings and N. S. Thread Plugs and Rings.

Write, wire or call about your requirements.

CADILLAC GAGE COMPANY • 20316 HOOVER RD. · DETROIT, MICH.

CADILLAC GAGE COMPANY
DETROIT

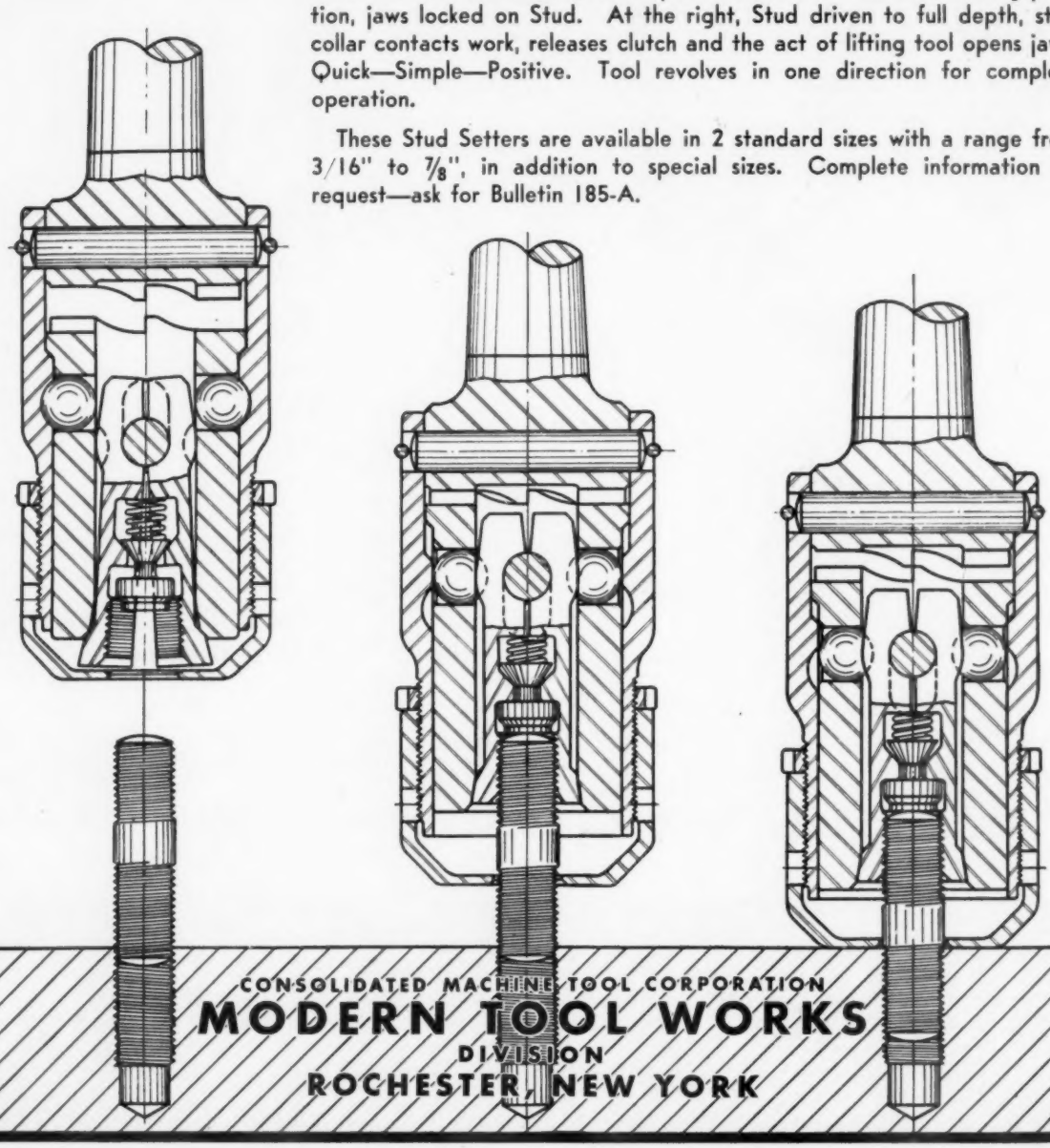
SPEED-UP YOUR
STUD SETTING WITH

MODERN SELF-OPENING STUD SETTERS

HERE'S HOW IT WORKS!

The 3 steps in setting studs with a Modern Self-Opening Stud Setter are shown below. At the left, Jaws open to take stud. Middle, Driving position, jaws locked on Stud. At the right, Stud driven to full depth, stop collar contacts work, releases clutch and the act of lifting tool opens jaws. Quick—Simple—Positive. Tool revolves in one direction for complete operation.

These Stud Setters are available in 2 standard sizes with a range from 3/16" to 7/8", in addition to special sizes. Complete information on request—ask for Bulletin 185-A.



CONSOLIDATED MACHINE TOOL CORPORATION
MODERN TOOL WORKS
DIVISION
ROCHESTER, NEW YORK

The aircraft hose and the Mill-Supply Salesman traveled de luxe—and *Planes left the factory a week ahead!*

Fighting planes were grounded—inside the factory! Production was slowing—soon would stop unless critical hose could be had immediately. Not a foot of it anywhere in the City—ordinary shipments would arrive too late. What to do?

Just *one* thing to do—and the plane manufacturer *did* it! He called in his Mill Supply Distributor, who right away got the rubber company on long distance.

That night one of his men hopped the Limited—picked up the hose next morning—made an extra sleeper reservation—and traveled back with all that hose in a berth!

That emergency delivery kept planes pouring down the line and saved the manufacturer a full week's production. Nobody *ever* will know how much those extra days' output have helped to speed the Peace!

It was all in the day's work for the Distributor. But it carries a big moral:— *in* a pinch or *before* a pinch, always call in the Industrial Supply Man.

You can depend on his resourceful help—we *know* you can, because for many years he and other Distributors all over America have represented us in selling Cle-Forge High-Speed Drills and Peerless High-Speed Reamers.

This incident is typical of the unusual services that many Mill Supply Distributors are rendering their customers during the Emergency.

ARMY NAVY

Awarded May 22, 1942
Superseded July 13, 1942

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49th STREET
CLEVELAND

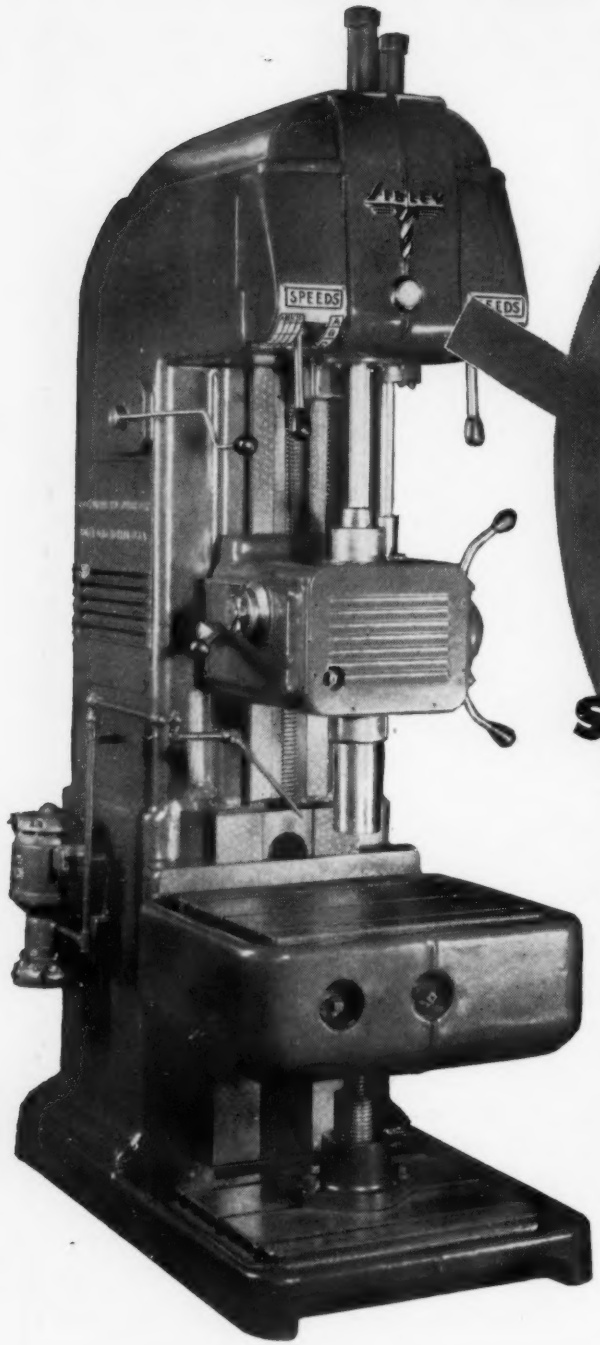
TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

30 READE ST. NEW YORK · 9 NORTH JEFFERSON ST. CHICAGO · 650 HOWARD ST. SAN FRANCISCO
6515 SECOND BLVD., DETROIT · LONDON - E. P. BARRUS, LTD.- 35-36-37 UPPER THAMES ST., E.C.4

ARMY E NAVY

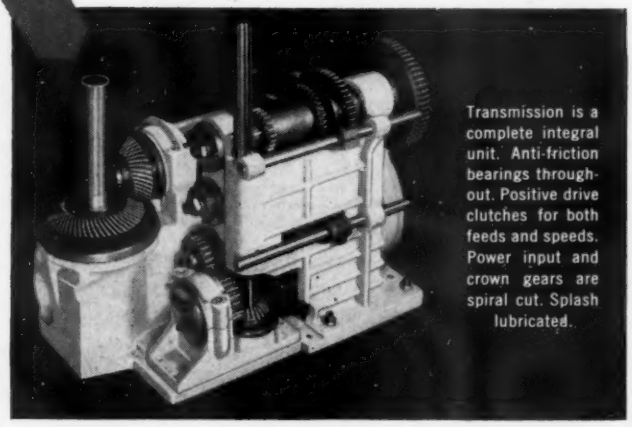
Awarded August 8, 1942
★

"CLEVELAND" DISTRIBUTORS EVERYWHERE ARE READY TO SERVE YOU



CUTTING SPEEDS

A REASON FOR THE SIBLEY 25" POPULARITY



Transmission is a complete integral unit. Anti-friction bearings throughout. Positive drive clutches for both feeds and speeds. Power input and crown gears are spiral cut. Splash lubricated.

SPINDLE SPEEDS AND FEEDS											
35	45	60	75	105	130	175	230	285	360	505	665
50	65	90	115	155	195	260	345	430	540	760	1000
75	95	135	175	230	290	390	520	650	810	1140	1500
.005"		.007"	.009"	.012"		.016"	.018"	.024"	.032"	.045"	

DRILLING **REAMING** **TAPPING** **BORING**

The wide range of cutting speeds available with the Sibley 25" Geared Drilling Machine enables it to handle a variety of jobs. Compare the speeds listed in the chart at left with those of your present drill equipment, and you will readily see one of the many reasons for the Sibley 25" popularity.

With its rugged construction, extensive power, and large selection of feeds and speeds, the Sibley has everything necessary to help you set new standards of maximum production.

Three optional ranges of spindle speeds and 9 spindle feeds are available—as listed at left. Quick change feed and speed selectors permit instant selection for quick change-over on jobs.

Sibley Drills are manufactured in 25" Geared Drive; 20", 24" and 28" with Individual Motor Drive.

SIBLEY

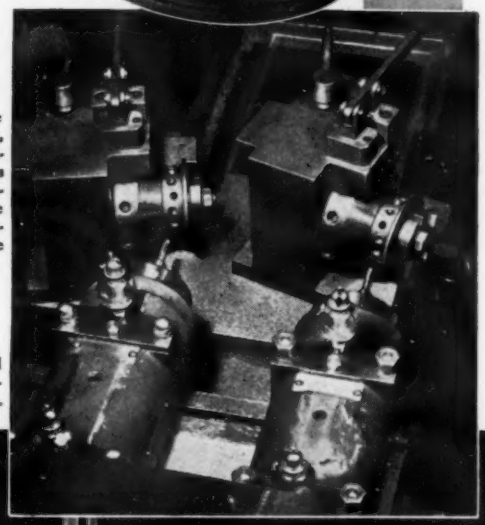
MACHINE & FOUNDRY CORP.

30 EAST TUTT STREET, SOUTH BEND, INDIANA

DRILLING MACHINE MANUFACTURERS SINCE 1876

showing the 14 Angular Piston Holes which are rough and finish bored on the Stokerunit Simplex Precision Boring Machine. Holes alternate directionally at 18° angles.

(*Right*) Two holes are bored simultaneously, work being indexed manually to next set of holes in same angular direction. Work pieces are then transposed in fixtures to bore alternate holes.



(*Below*) Accuracy and finish maintained in production by girl operator.

WRITE TODAY for these two booklets covering our entire line of Simplex Precision Boring Machines. Complete data and specifications are included.

14 ANGULAR PISTON HOLES IN PUMP CYLINDER

Rough and Finish Bored on Two-Spindle

STOKERUNIT SIMPLEX *Precision* BORING MACHINE

The 14 angular piston holes in this pump cylinder alternate directionally at 18° angles. To insure the required accuracy in radial location, angles and diameter, precision boring equipment with proper fixtures is indispensable.

On this job, No. 1 Stokerunit Simplex Precision Boring Machines with two spindles are maintaining close tolerances in all dimensions. Diameter of the rough bore is .3594″ and is held to ±.001″ with a stock removal of .020″–.025″. On the finishing operation, the diameter of the bore is .4053″ and is held to ±.00015″ with a stock removal of .012″–.015″; high finish is assured. Radial location is held to within .003″ on both operations. Length of bore 1″.

Actual boring time on both operations is 20 seconds per hole, two holes being bored simultaneously as shown in upper illustration at left. Feed is 3″ per minute; speed 1750 r.p.m. Stock is 50,000 tensile iron.

OVER 25 MODELS of Stokerunit Simplex Precision Boring Machines are available in both mechanical and hydraulic feeds, with single or multiple spindles, for either short-run or production work. Among them you may find the model which will meet *your* precision boring problems.

Get the complete Stokerunit story now. For specific recommendations, send blueprints of parts with your production problems. There is no obligation.

STOKERUNIT CORPORATION

SIGNERS AND BUILDERS OF PRECISION BORING MACHINES AND MILLING MACHINES

4524 WEST MITCHELL STREET • MILWAUKEE, WISCONSIN

Cleared for

ACTION

. . . and keeping pace with the ever increasing performance of our Air Force, are these 3 Spindle-No. 3 MA-6 (capacity of 1¼") cast iron, ball bearing Drilling Machines. Equipped with Aveymatic Power Feed.

THE AVEY DRILLING MACHINE CO.
CINCINNATI, OHIO U. S. A.

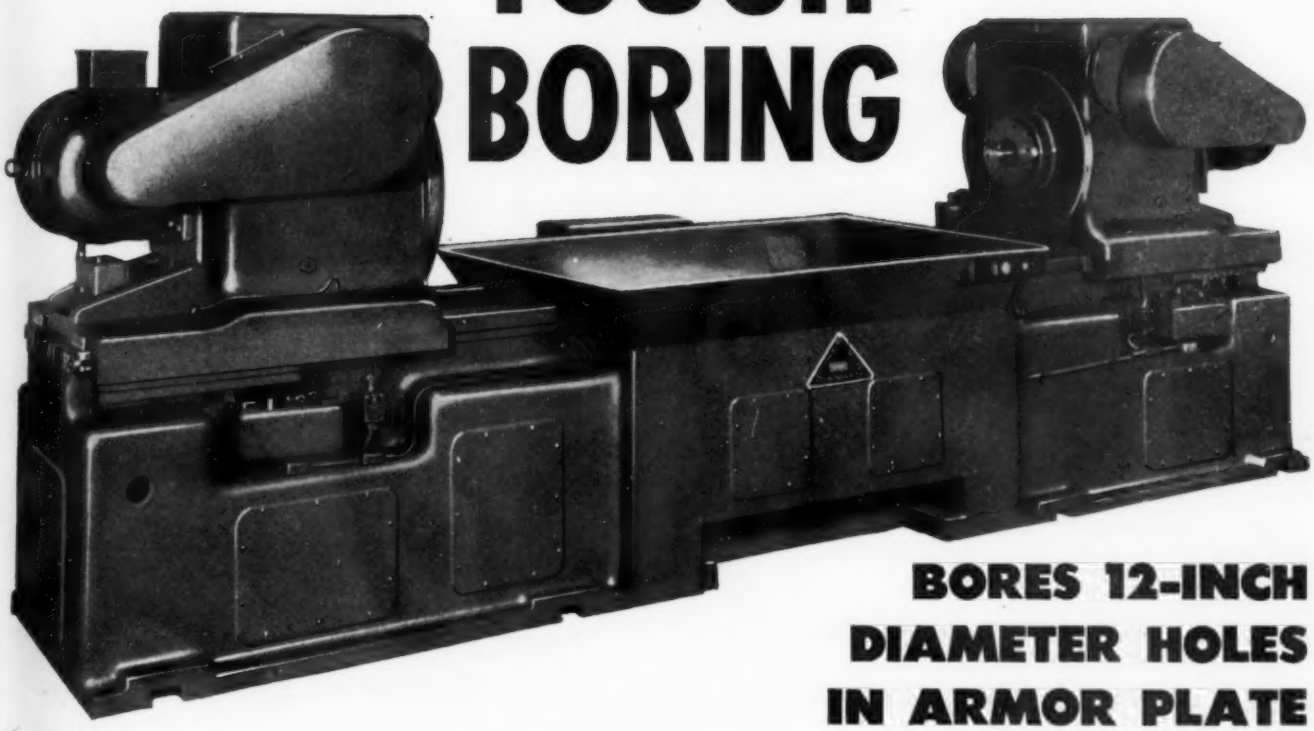
CINCINNATI · OHIO

Avey DRILLING MACHINES

ARMOR BORING

This powerful machine engineered and built by LeMaire

for TOUGH BORING



BORES 12-INCH DIAMETER HOLES IN ARMOR PLATE

LeMaire again meets a difficult problem!

When a manufacturer asked for a machine to bore large diameter holes in heavy armor plate, this is the machine that resulted.

It bores 12-inch diameter holes in each end of the part. The speed of the extra-large spindles, carried by the heads, can be changed by means of pick-off gears. The hydraulic system is arranged for rapid advance feed and rapid return. Adjustments provide selective feeds. The hydraulic cylinders possess oversized capacity to insure even feed and to give ample thrust capacity at the spindles.

The one-piece cast iron bed, heavily ribbed, supports ways which have been purposely made wide to reduce bearing loads on the slides. Since the alignment of the holes in the work is held within very close limits, the machine is engineered with extra strength built-in at all points to hold distortion down to a minimum.

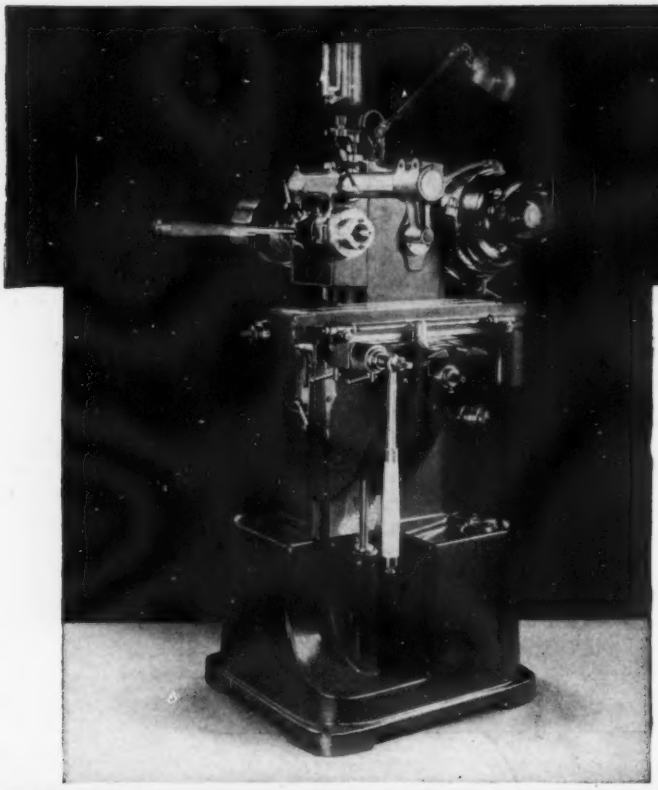
Perhaps you would like your production to gain a few more parts per hour. Perhaps we can design and build a machine to meet your increased schedules. A consultation with us will not obligate you.

BUY WAR BONDS

LeMaire TOOL & MFG. CO.

2665 S. TELEGRAPH ROAD ▲ DEARBORN, MICHIGAN

ENGINEERS AND BUILDERS OF PRODUCTION MACHINES



THE NICHOLS HAND MILLER

» A modern, convenient machine for the volume production of accurate parts . . . .

In the "NICHOLS", the usual features of the hand miller have been combined with a ruggedness of design and construction which makes it a truly production machine tool offering high cutting speeds, maintained precision and long life. A wide variety of operations can be handled at top speed and reduced cost as compared with the same work produced on larger slower machines.

Because of its precision, great versatility and quick set-up, the Nichols Hand Miller is particularly adapted to tool room requirements. Its wide use in this class of service by leading manufacturers is evidence of its recognized value and suitability in meeting the requirements of modern shops.

•

Capacity: Longitudinal Feed, 10"; Transverse Feed, 7"; Vertical Feed of Knee, 13½"; Vertical Movement of Head, 4½", Working Surface of Table, 6½" x 21"; Spindle Speeds, 100, 200, 600 and 1200 R.P.M.

Send for Illustrated Bulletin giving Complete Information

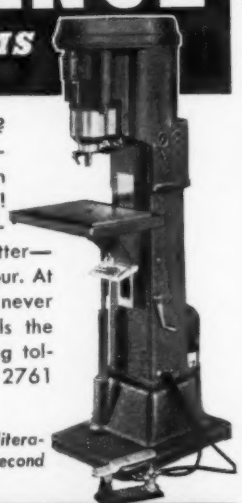
W. H. NICHOLS & SONS *Waltham, Mass., U.S.A.*

Second Operation Tapping

THE ANSWER TO

TOLERANCE

PROBLEMS



ARE YOUR automatics overloaded? Are you having trouble meeting tapping tolerance specifications? Then look into Second Operation Tapping! On specialized Haskins Tappers, critical tapping can be done faster—better—at less cost per man and machine hour. At less tap replacement expense. There's never a tolerance problem, for air controls the accuracy of the work. Within amazing tolerance limits. R. G. Haskins Company, 2761 W. Flournoy St., Chicago.

Send for TAPPING TIPS—new literature that gives money-saving second operation tapping ideas.

HASKINS

HASKINS *Precision* TAPPING EQUIPMENT

HOLMAN

BETTER, FASTER HOLE FINISHING

HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

HOLMAN REAMER CO.
MANCHESTER, CONN.

LUCAS "PRECISION"

Horizontal Boring, Drilling and Milling Machine

THE LUCAS MACHINE TOOL CO.

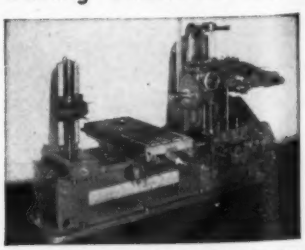
NOW AND ALWAYS 01

CLEVELAND
OHIO, U. S. A.

UNIVERSAL *Horizontal Boring Machine*

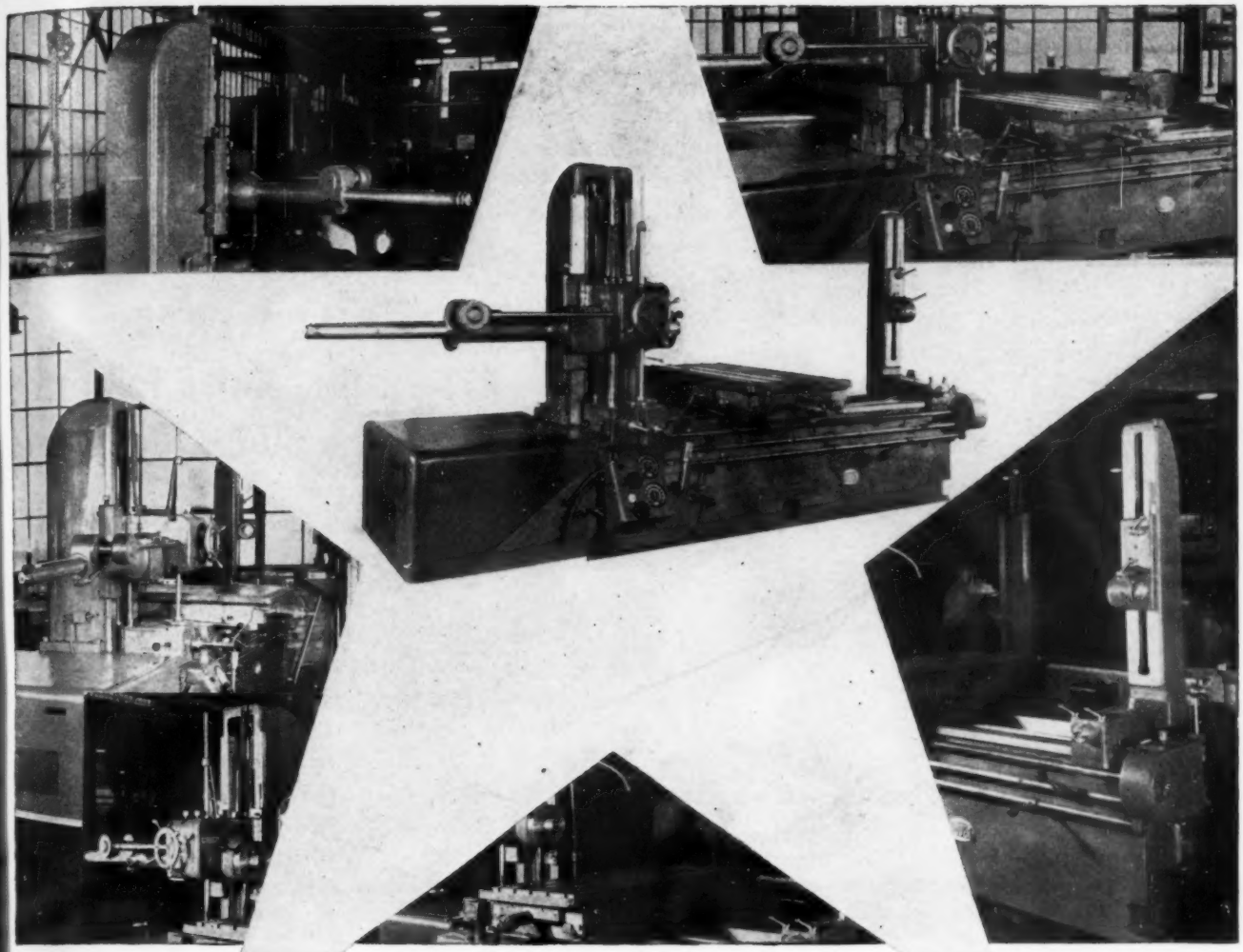
The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

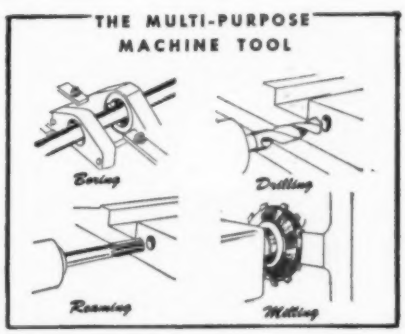
UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.



Get the Latest Improvements IN THE YODER 3A HORIZONTAL BORING MILL

YOU'LL WANT THESE FEATURES . . .

Adjustable tapered gibs . . . a two-speed rapid traverse . . . direct drive for spindle . . . spindle and bar are lap fitted . . . verniers and micrometer dials are provided for vertical head and outboard bearing adjusting screws . . . infinite spindle feeds and speeds . . . dynamic braking . . . quick acceleration . . . and many more features that make this the latest in design and construction of boring Mills.



The ENGINEERING YODER MANUFACTURING **SALES COMPANY**

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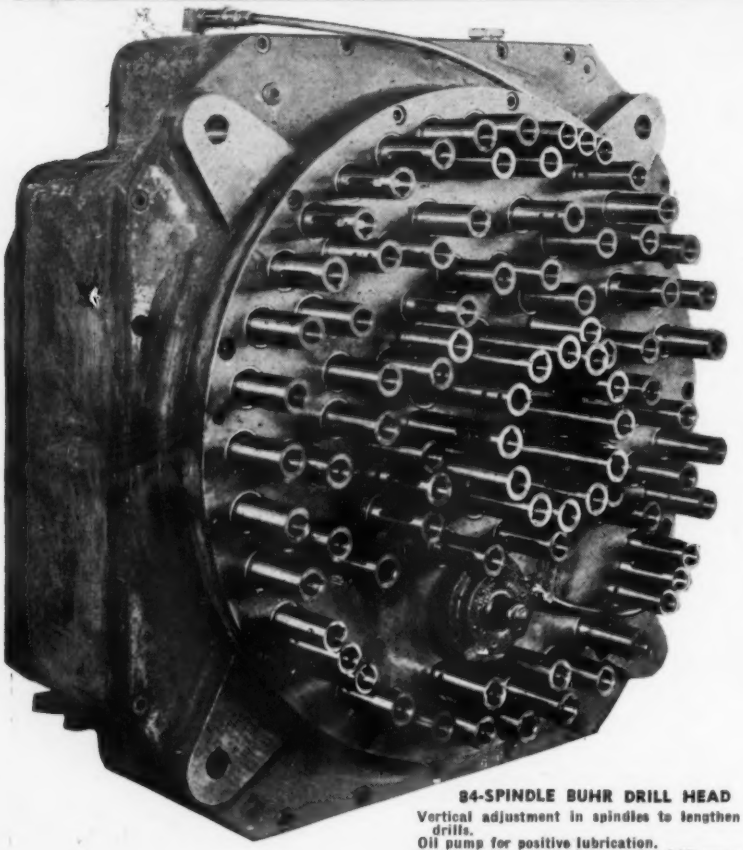

84-SPINDLE BUHR DRILL HEAD
Vertical adjustment in spindles to lengthen drills.
Oil pump for positive lubrication.
Mounted on a vertical hydraulic drill press.
For drilling all holes in super charger cover.

NIGHT and DAY

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MULTIPLE PRODUCTION DRILL HEADS

Are Putting Holes In Parts Used in Our All-Out War Effort

Similar applications of BUHR Multiple Spindle Drill Heads *will* speed your work. Give them a trial in your plant. Send us your blueprints — we'll make suggestions and recommendations on the use of BUHR engineering and equipment.

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Specialists in Multiple Spindle Drilling, Boring, Reaming, Tapping Equipment

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Our High Speed Tappers are Super-Sensitive for Small Tapping

Style B Positive Stop Holds Work Down.

Style C Graduated Adjustable Safety Friction.

DRILL PRESS TURRET

Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustments in each tap-holder, if required.

Also, Opening Die-Heads; Opening Stud-Setters; Friction Screw-Drivers and Nut-Setters, etc.

CRITERION
Boring Head
Speed
PRODUCTION

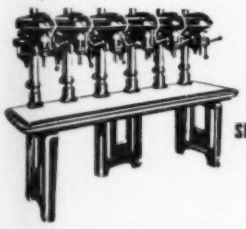
These Criterion heads save time! Smooth, compact, rigid! Large, easy-to-read, graduated dial. Lead screw is hardened tool steel. ITS THREADS ARE GROUND FROM THE SOLID AFTER HARDENING, assuring constant accuracy. Parts subject to wear are hardened. Large offset adjustment eliminates need for offset boring bars. Two sizes. 1½" and 3" ½" and 1" bar capacity Ask your dealer, or order direct. Request free literature.

CRITERION MACHINE WORKS
BEVERLY HILLS CALIFORNIA
NEW YORK OFFICE
205 E. 42ND ST., N. Y.

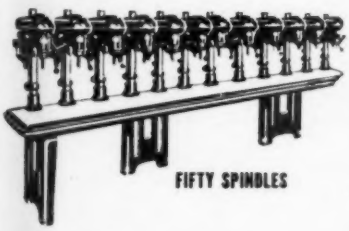
8-Spindle 17" drill press unit with No. 2 Morse Taper Spindles—Table surface 23⅝"x125"; drilling capacity, ¾" in Cast Iron.

TWO SPINDLES

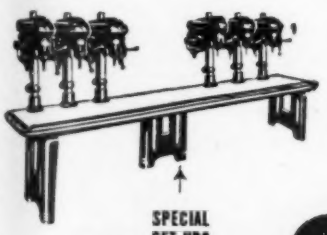
THREE SPINDLES



SIX SPINDLES



FIFTY SPINDLES



SPECIAL SET-UPS

DRILL PRESS COMBINATIONS

exactly as you need them!

New, Exclusive Delta Machine gives you as many spindles as you need —*spaced as you need them*— at astonishingly low cost!

Designed and developed by Delta, pioneer producers of low-cost production drilling equipment, these new machines now give you just the number of spindles you need for any production set-up—two, three, six, eight, ten spindles or fifty—to suit your exact requirements.

Available with 14" or 17" heads—or any combination of both, with Jacob's chucks or No. 1 Morse-taper spindles in 14" heads; Jacob's chucks or No. 2 Morse-taper in 17" heads—high speed or low speed. Completely flexible and remarkably low in cost!

This new type of machine—already in use in many high production plants—gives you an efficient, continuous production line, eliminating transferring between machines—and provides maximum working surface.

Ideal for special set-ups on long, heavy work, because sectional tables can be made as long as necessary. Tables are accurately ground and fitted and the entire unit is heavy, rugged and accurate.

SEND FOR CATALOG

For full details on this new "Tailor-made" drill press development—get in touch with your nearest Delta Industrial Distributor. Write us today, telling how many drill press heads you could use on a set-up like this, whether you need 17" or 14" heads or a combination of both, and how far apart you want the heads placed. We will gladly send you complete specifications, prices and any other information you wish.

THE ARMY-NAVY "E"—Awarded for excellence in the production of machine tools vitally needed in the war effort.

DELTA
MILWAUKEE

THE DELTA MANUFACTURING COMPANY
608-C E. Vienna Ave., Milwaukee, Wis.

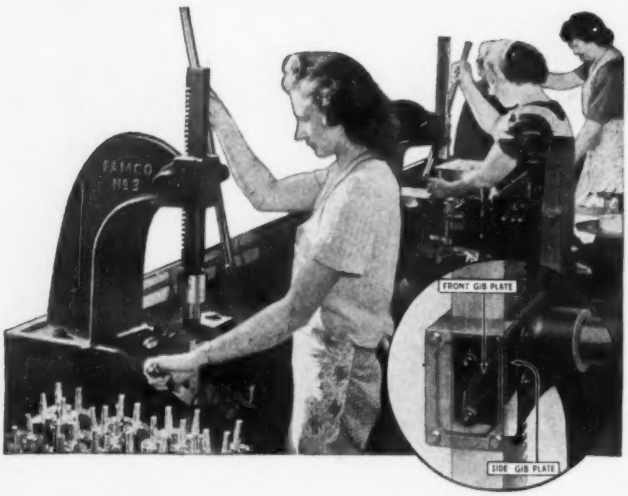
Please send us without obligation full information on your new drill press development. We are interested in . . . drill presses on this set-up . . . . 17", ... 14", spaced . . . . inches apart.

Name .....

Address .....

City ..... *State* .....

NOW Speed-up PRODUCTION with FAMCO PRESSES



EXCLUSIVE ADJUSTABLE GIB

Famco Presses are speeding production and assembly jobs in war plants throughout the nation. They are adaptable to a multitude of operations . . . as above, where a Bench Type Arbor Press is flaring insulation on armature cores of Dumore aviation motors. Only Famco Arbor Presses are equipped with adjustable gibs for front and side plate adjustment to compensate for wear, eliminate "shimmy" and assure perfect ram alignment at all times. Write for facts on the complete Famco line. Famco Machine Company, 1316 18th Street, Racine, Wis.

Bench Model Arbor Press

BENCH AND FLOOR MODEL ARBOR PRESSES

Famco builds 32 stock sizes of Arbor Presses in floor and bench models. Available pressures range from one-half to 15 tons in three types of presses . . . plain lever type, simple ratchet type, and combination compound and simple ratchet type. Pilot wheels in three different sizes can be furnished for all models of Famco Arbor Presses. Floor stands are available for mounting bench models if bench-mounting is not desired. All essential service parts carried in stock. Consult with Famco engineers about the right size and type of Arbor Press for your particular job.

Floor Model Arbor Press

FAMCO FOOT PRESSES

Available in both bench and stand-mounted types, Famco Foot Presses are built in 10 different sizes and models. They are sturdily constructed of semi-steel and are accurately machined for long, trouble-free operation.

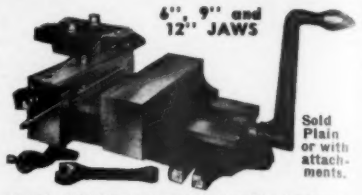
No. 15 Foot Press

famco

Foot and Arbor PRESSES

GRAHAM MULTI-PURPOSE VISE

With special V-jaws, shell jaws, stops, drill guides, etc., this vise puts a ready-made jig on your drill press, radial, shaper, miller, grinder, planer. Also sold plain, drilled for attachments.



KNURL HOLDER FITTING LATHE TURRET

Using only straight-cut knurls, this tool gives a wide variety of straight, spiral and checkered patterns. Capacity: up to 2½" dia. of work.

Request Illustrated Price Circulars

GRAHAM MFG. CO. 86 BRIDGE ST. EAST GREENWICH, R. I.

STRAIGHT SIDE SINGLE CRANK PRESSES

for heavy blanking and forming

Heavier classes of blanking and forming work can be handled efficiently and economically on these presses.

Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

Full details on request.

straight side press

ZEH & HAHNEMANN CO.

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LUERS

Patented Cutting Off Tool Holders

Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips—MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By

J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.

Produced under License issued by John Milton Luers Patents Inc.

Die-Making Machines

They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin —also circulars on Drill pointers, Point Thinners, Mill cutter Grinders and Tap Grinders.

OLIVER OF ADRIAN PRODUCTS

Oliver Instrument Co., 1414 Maumee St., Adrian, Mich.

BAUMBACH STANDARDIZED DIE SETS

BETTER-MADE

DIE SETS

AT LOWER COST

46 Styles—195,000 Sizes

E. A. BAUMBACH MFG. CO.

Machined Steel Drop Forged Steel Semi-Steel

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1812 South Kilbourn Ave., Chicago, Ill.

PRESSES
FEEDS
AUTOMATIC EQUIPMENT

THE V & O Press Co. INC.

HUDSON, N. Y.

THE TRANSVERSE TRAVEL METHOD

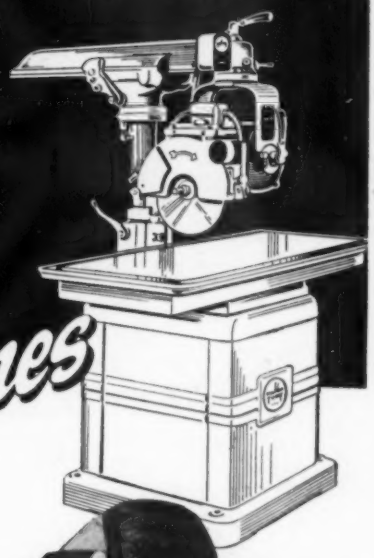
cuts wide steel sections faster – in the

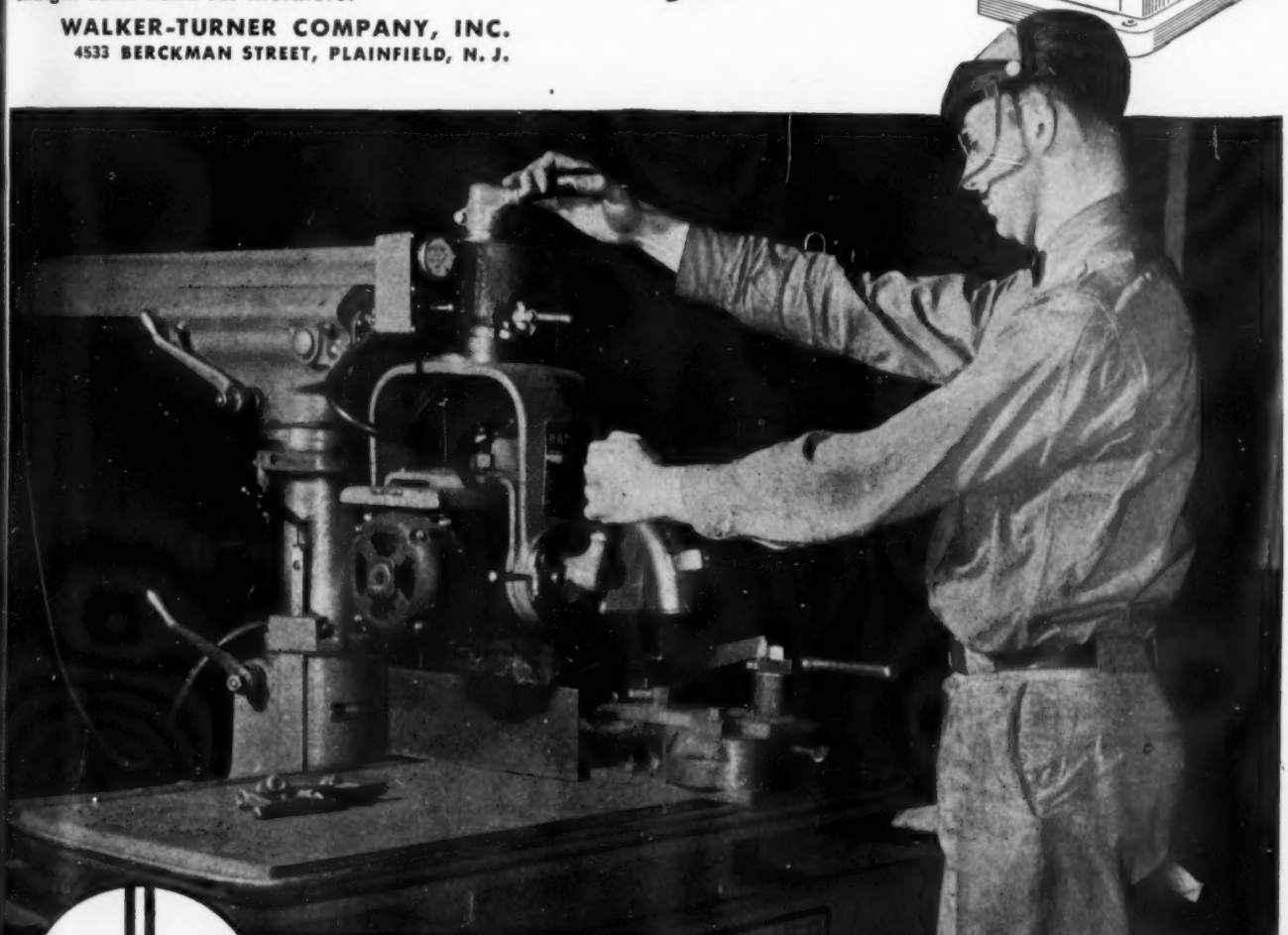
The Walker-Turner Metal-Cutting Radial Machine has two notable features that enable it to give outstanding performance in cutting wide, comparatively flat metal stock. One is the sliding ram permitting transverse travel of 21½". This enables the blade to feed through the work with a shorter cutting arc and less frictional heat than in other cutting methods.

The second feature is the patented Walker-Turner Geared Motor, the gears of which are fully protected against damage from overload. The shaft operates at the bottom edge of the motor, enabling deep cuts to be made with much smaller wheels than in the conventional motors. The blades being smaller, may also be thinner—effecting a substantial saving in metal. With this machine, it is easy to "trench" or dado, miter and compound miter, as well as make straight cuts. Send for literature.

WALKER-TURNER COMPANY, INC.
4533 BERCKMAN STREET, PLAINFIELD, N. J.

walker-Turner
METAL CUTTING
Radial Machines



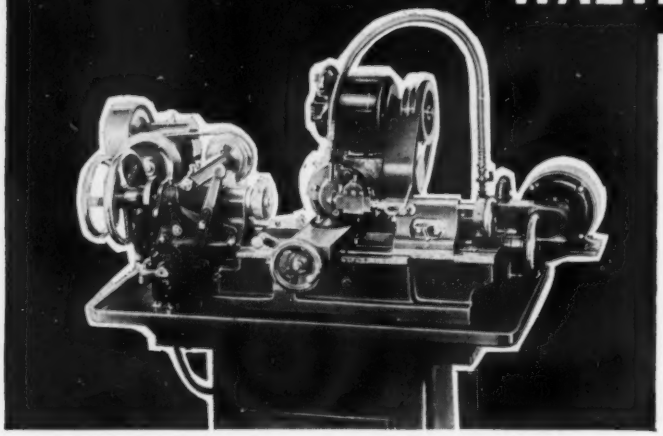


walker-Turner
COMPANY, INC.
PLAINFIELD, N.J.
U.S.A.

MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

HIGH PRODUCTION WITH MAINTAINED ACCURACY
assured by WALTHAM THREAD MILLERS

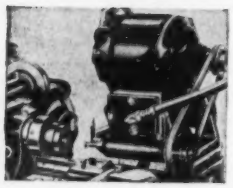


These sturdy machines—for either tool room or production use—will mill a wide variety of standard threads to highest precision standards. Cutters can be supplied for producing such forms as V, N, Whitworth, Buttress, etc. They are best adapted to work 2" or less in diameter but will handle 3" work.

Improved design of these machines has been realized by the use of three motors. Greater rigidity of the cutter head and increased speed range have been attained. By providing three motors individual speed change and reverse for both the cutter and the work as well as a constant speed for the pump are realized.

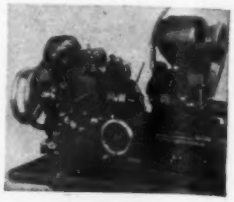
Standard equipment includes three motors with push button start and automatic or push button stop, follow rest, one milling cutter, indexing device for cutting multiple threads, 5 pitch lead screw and 13 change gears for cutting from 5 to 40 threads per inch.

A wide range of extra equipment and attachments is available for extending the usefulness of this machine. Full and complete details available promptly on request.



Machine equipped with Internal Threading Attachment involving a special motor driven cutter head which may be swivelled to helix angle. Cutter may be centered for varying length of arbors.

Machine equipped with Relieving Attachment. A special work head with spindle geared to a camshaft replaces lead screw and is connected by levers to move cutter in and out. A compound taper attachment is also included.



WALTHAM MACHINE WORKS WALTHAM MASS.

WALTHAM TRADE MARK REGISTERED U S PAT OFF

HAMILTON
SWISS TYPE
GEAR HOBBERS

. . . for accuracy and speed in hobbing pinions, gears and sectors.

TWO MODELS

No. 00 SPUR GEAR HOBBER (Illustrated) for work up to 2" dia.

No. 1 SPUR and SPIRAL GEAR HOBBER for work up to 6" dia.

Write for further details to

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Exclusive Sales Agents
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HAMILTON TOOL CO., *Builders*
Hamilton, O.

LELAND-GIFFORD COMPANY WORCESTER MASS. U.S.A. TOOLS-GRAMS-SPARTS

Drilling and Tapping Machines
(Automatic and Semi-Automatic)
LELAND GIFFORD CO
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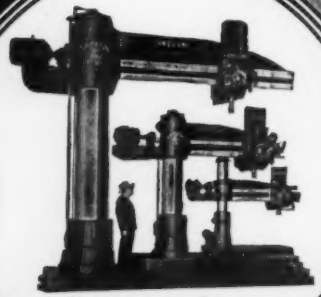
DIES TAPS
GEO MET RIC
Right from the Lead
THE GEOMETRIC TOOL CO.
NEW HAVEN, CONN.



"Anti-friction Bearings Throughout"

CARLTON RADIAL DRILL

FEATURES— 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The
CARLTON
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

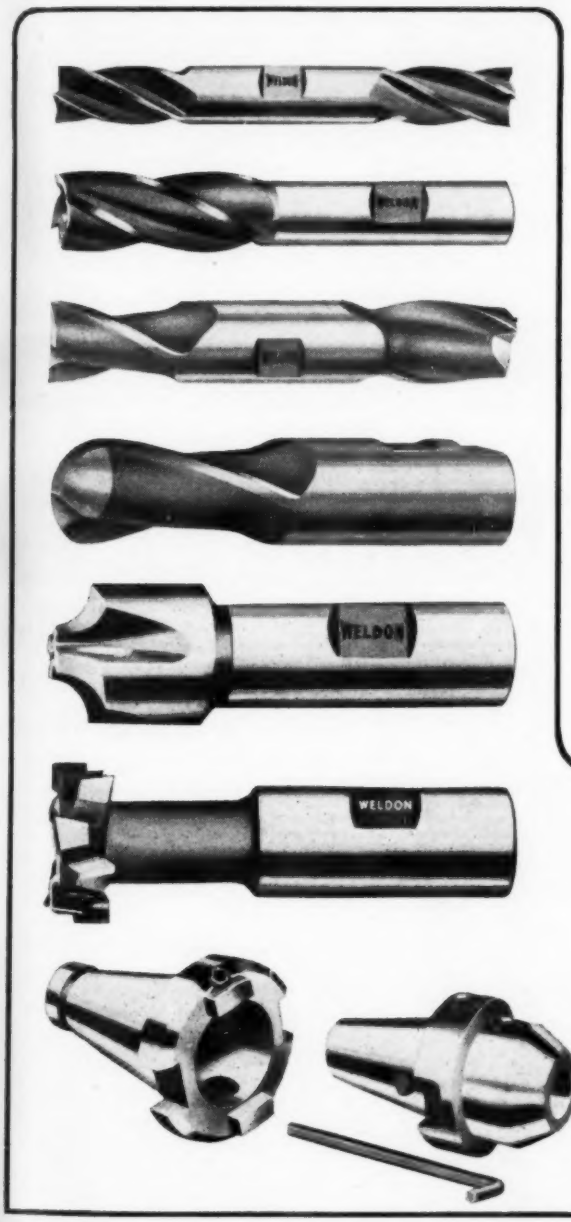
ARMY E NAVY

WELDON

CELEBRATES 25 Years OF SERVICE TO INDUSTRY

ORIGINAL CATALOG

PRESENT CATALOG



● The Weldon Tool Co. during its first 25 years of service has made several notable contributions to industry by improving end mill design and operation.

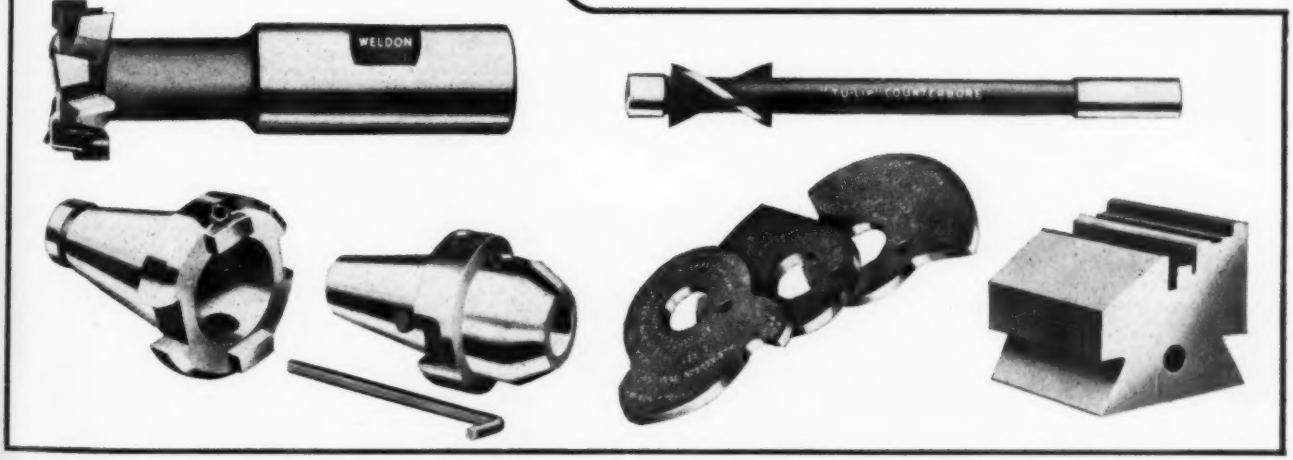
Weldon increased the spiral angle of the flutes on end mills to approximately 30 degrees. This permitted the use of higher speeds and feeds and was the first major improvement in end mill design.

To get full advantage of the higher speeds and feeds Weldon next experimented with the tooth shape and perfected the hollow ground tooth and also developed the double back-off. The curved face of the hollow ground tooth allows chips to curl without clogging. The double back-off, by eliminating the extremely acute cutting edge, insures longer life for the tooth.

Weldon also introduced the double end mill which has one shank for two end mills providing the work capacity of two end mills in a single tool at a cost slightly greater than a single end mill.

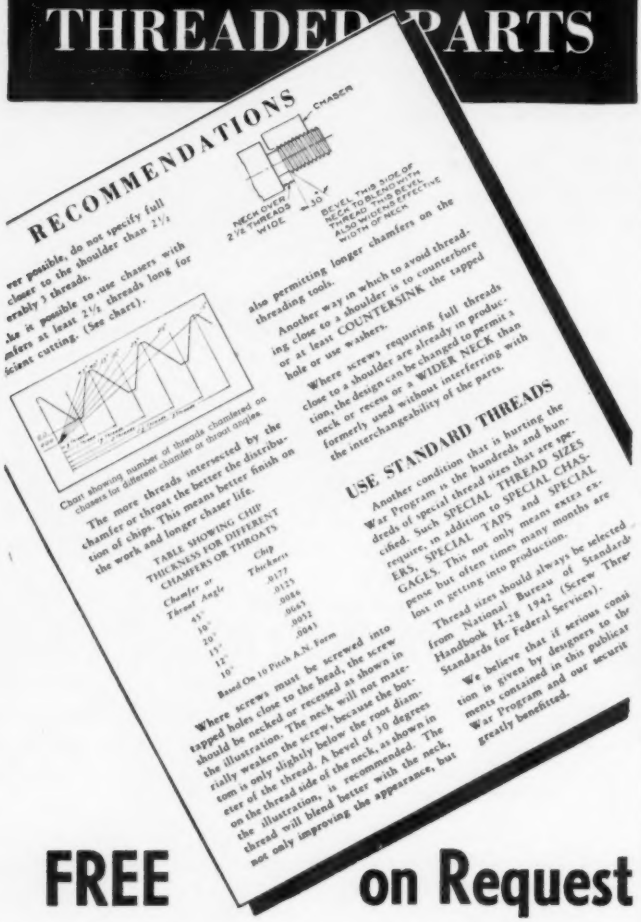
Today, to maintain this recognized leadership WELDON metallurgists and engineers continue to improve End Mill material specifications, design and performance.

Many other Weldon tools, illustrated in catalog 8-B, are saving time—improving operation—increasing production and reducing costs for hundreds of plants now engaged in vital war production. May we send you a copy of the latest edition?



THE WELDON TOOL CO. Cleveland, Ohio

A FEW IMPORTANT SUGGESTIONS ON THE DESIGN OF THREADED PARTS


RECOMMENDATIONS

ver possible, do not specify full
closer to the shoulder than 2½
erably 3 threads.
he is possible to use chasers with
nfers at least 2½ threads long for
ficient cutting. (See chart).

Chart showing number of threads chamfered on chasers for different chamfer or throat angles.

The more threads intersected by the chamfer or throat the better the distribution of chips. This means better finish on the work and longer chaser life.

TABLE SHOWING CHIP THICKNESS FOR DIFFERENT CHAMFERS OR THROATS

Chamfer or Throat Angle	Chip Thickness
45°	.0177
30°	.0125
20°	.0086
15°	.0065
12°	.0052
10°	.0043

Based On 10 Pitch A.N. Form

Where screws must be screwed into tapped holes close to the head, the screw should be necked or recessed as shown in the illustration. The neck will not materially weaken the screw, because the bottom is only slightly below the root diameter of the thread. A bevel of 30 degrees on the thread side of the neck, as shown in the illustration, is recommended. The thread will blend better with the neck, not only improving the appearance, but also permitting longer chamfers on the threading tool.

Another way in which to avoid threading close to a shoulder is to counterbore or at least COUNTERSINK the tapped hole or use washers.

Where screws requiring full threads close to a shoulder are already in production, the design can be changed to permit a neck or recess or a WIDER NECK than formerly used without interfering with the interchangeability of the parts.

USE STANDARD THREADS

Another condition that is hurting the War Program is the hundreds and hundreds of special thread sizes that are specified. Such SPECIAL THREAD SIZES require, in addition to SPECIAL CHASERS, SPECIAL TAPS and SPECIAL GAGES. This not only means extra expense but often times many months are lost in getting into production.

Thread sizes should always be selected from National Bureau of Standards Handbook H-28 1942 (Screw Threads for Federal Services).

We believe that if serious consideration is given by designers to the comments contained in this publicat ments contained in this publicat War Program and our security greatly benefitted.

FREE on Request

This brief Bulletin deals with the subject "Threading Close to a Shoulder" and points out what to avoid and the effects on costs and the conservation of critical metals.

H&G DIE HEADS.

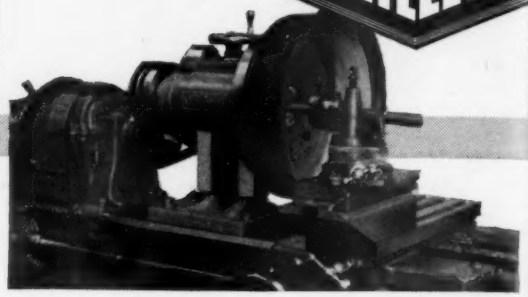
The Eastern Machine Screw Corporation

20-40 Barclay Street, New Haven, Conn.

Swing 16 inches

ON A 9-INCH LATHE

GLOBE MILLER

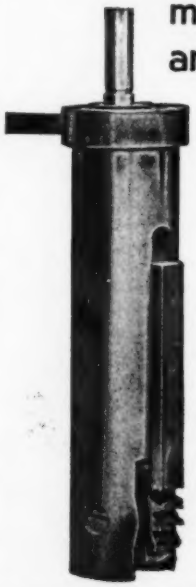


Attached in three minutes or less, the Globe Miller increases swing of your lathe 5 to 10 inches, depending on lathe size, permitting larger turning operations as shown above. With accessories, it performs practically all types of precision milling. Used extensively by U. S. Government. Write today.

GLOBE PRODUCTS MFG. CO.
3382 Robertson Boulevard Los Angeles, California

NATIONAL KEYSEATING MILLER

. . . the tool that converts drilling machines into key-seaters and saves time and money



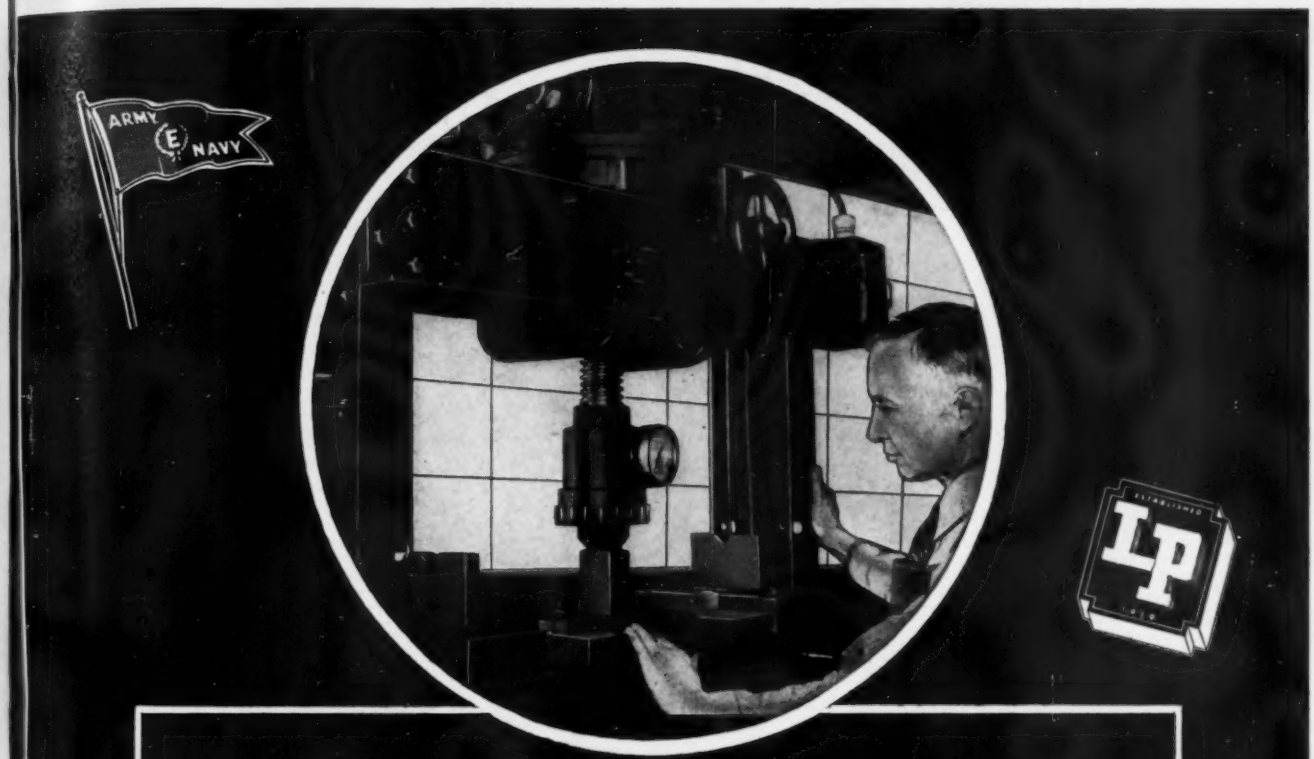
• With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

The National Keyseating Miller mills, keyseats in one cut. It can be used on taper holes, offset holes, blind holes and for taper keys. Work clamping is unnecessary. We also manufacture oil-grooving millers.

Made inn twenty-six different diameters from ½" to 3½". Several widths of cutters can be used in each size.

WRITE TODAY FOR OUR NEW CATALOG NO 15

NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO



60 Tons in 4 Seconds . . .

. . . is standard performance of the Lempco Series 300 PRESSUREMATIC Power Presses. Fast, rugged, powerful, *controlled* — Pressurematics are doing all kinds of assembling, straightening, press-fitting, and even die-forming jobs. Adjustable bolster, foot pedal controls, movable ram heads—all the features required for rapid, efficient, fool-proof operation by women or inexperienced men. You have your choice of several pressures, ram travels, and ram speeds to meet your specific needs. Write for detailed specifications.

PRE-SELECTED AUTOMATIC PRESSURE CONTROL

Special pressure control gauges are available sensitive within 100 lb. units up to 60 tons. These will stop ram automatically when pre-set pressure is reached, or may be set to instantly back off work any distance required and then come down again.

ELECTRIC AND HYDRAULIC PRESSES $215 TO $1398

IMMEDIATE DELIVERY

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PRODUCTS · INC.

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ESTABLISHED 1919

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LEMPCO PRODUCTS, INC., Dept. AM, Bedford, Ohio
GENTLEMEN: Tell me the plant or shop nearest my place of business where I may see a Lempco Press.

Name .....

Address .....

City ..... State .....

Get the same quick training for using MATHEMATICS on the job THAT FORD SHOP MEN GET in your spare time at home!

Here is an easy way to learn the special mathematics needed today by all mechanics for the solving of everyday shop problems. Already thousands have been successfully and rapidly taught by this simple system in the Ford Motor Company Schools. The mathematical background it helps you acquire in your spare time is exactly the practical kind you need to handle work better and to get ahead faster.

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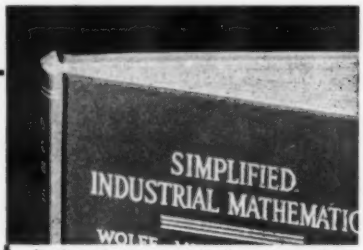

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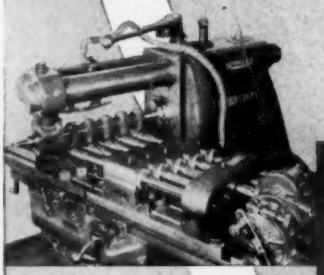

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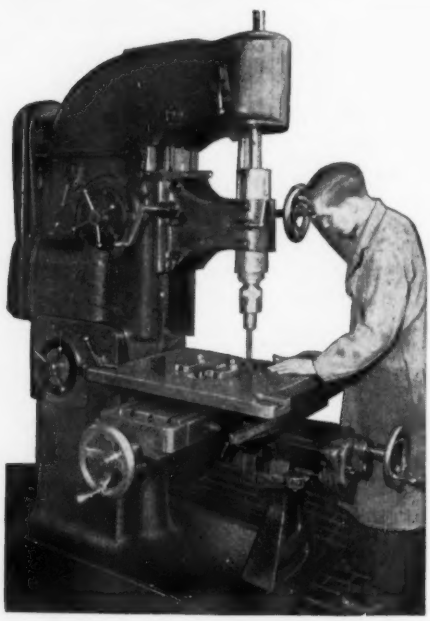

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Finishing Requires One Hour per Mold on Same Machine

PERFORMANCE DATA

MACHINE—Gorton 8½D Duplicator.
PART—Injection-type Plastic Mold.
QUANTITY—20.
MATERIAL—Tool Steel.
CUTTERS—Special Cutters and 2-Lipped ¼" dia. End Mills ground on Gorton Cutter Grinders.
OPERATIONS—Rough and Finish Machine Die Molds.
DIMENSIONS—1.720" dia. x 3.310" deep with 32° 41′ cone.
HOLDING—Locating Ring on Base of Rotary Table.
FEED—Manual.
SPEED—Roughing, 750 r.p.m.—Finishing, 3600 r.p.m.
FLOOR-TO-FLOOR TIME—3 Hours complete per Mold.
ACCURACY—Held to Close Tolerances with High Finish.

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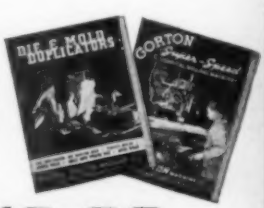
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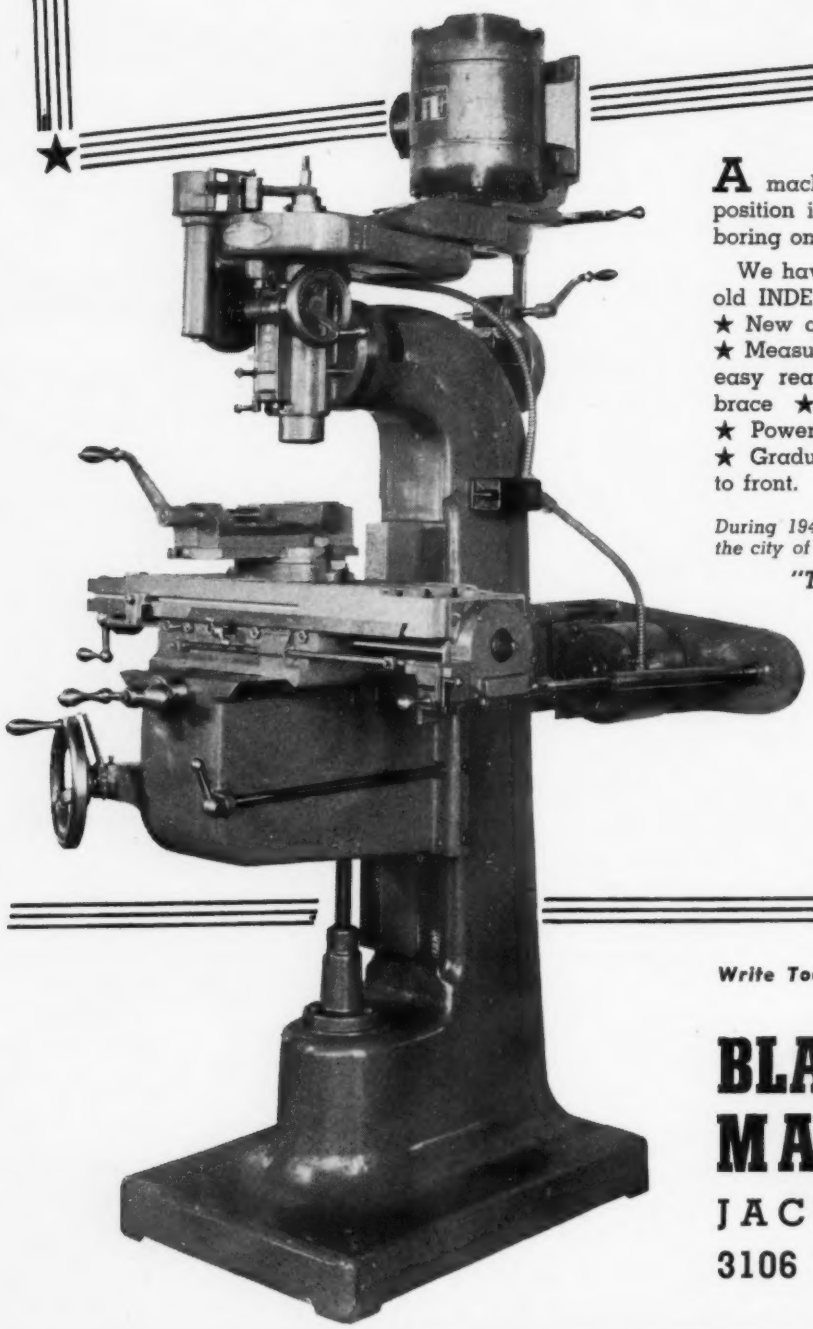

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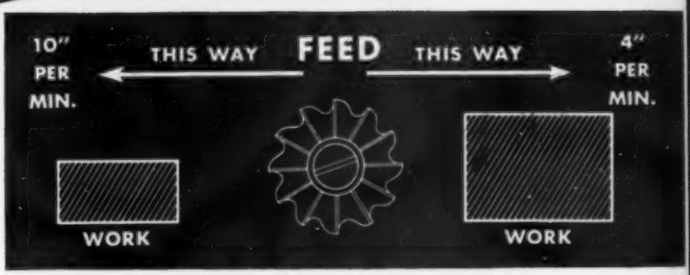

This example shows feed to left set at 10" per minute and that to right at 4" per minute. Or both feed rates can be exactly the same.

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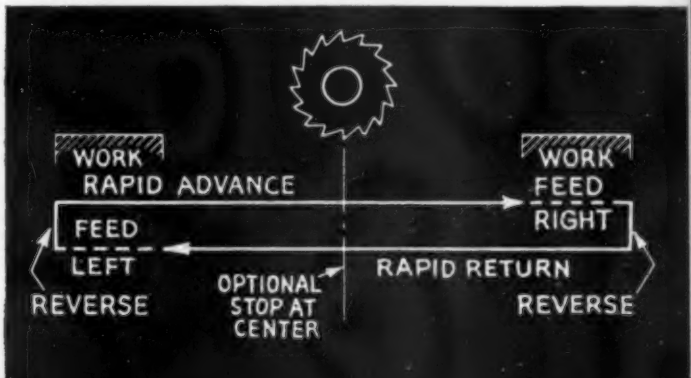

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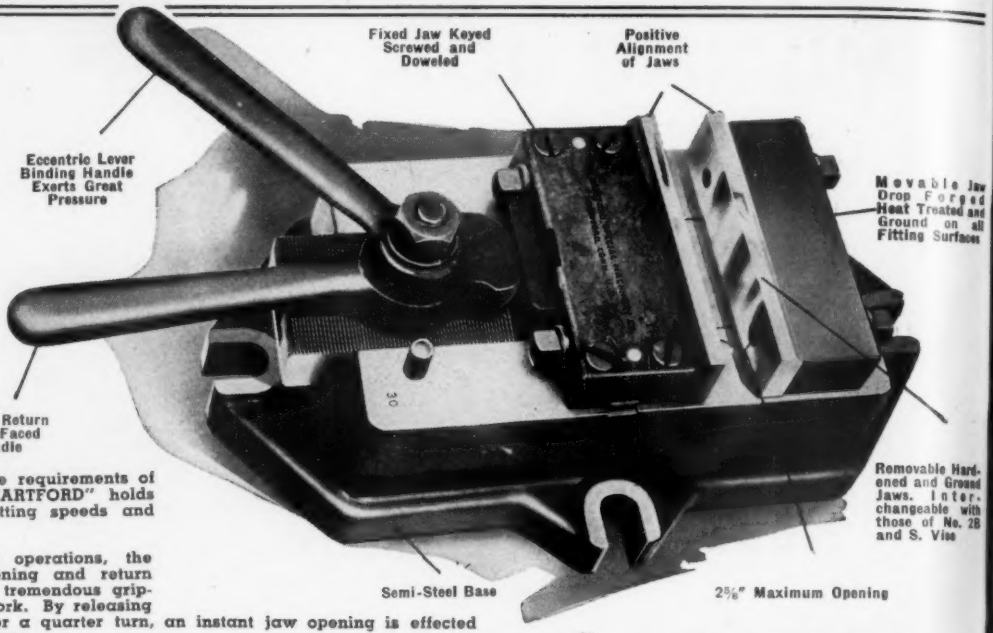
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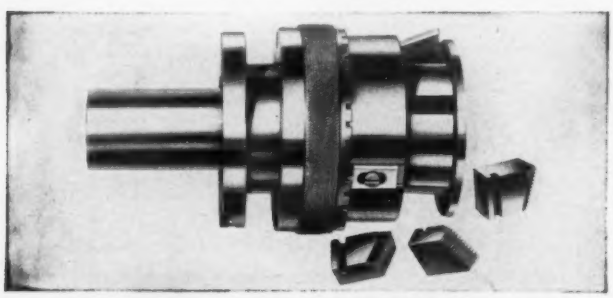

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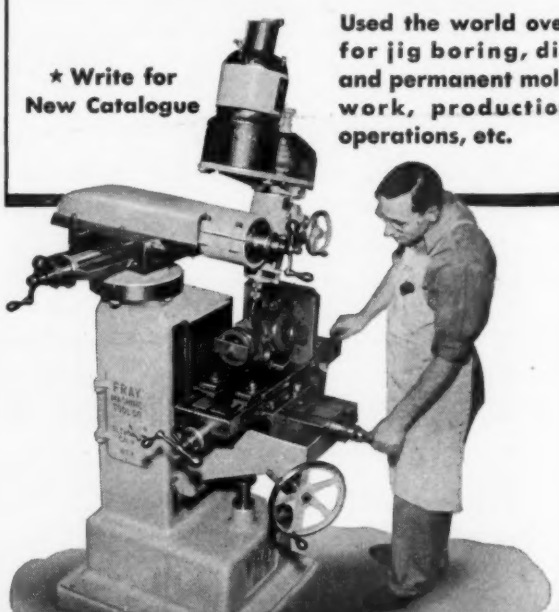

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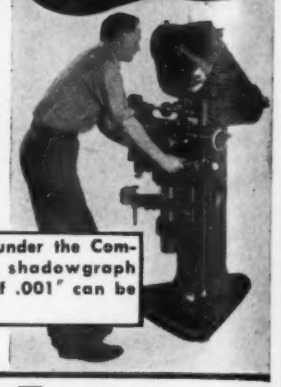

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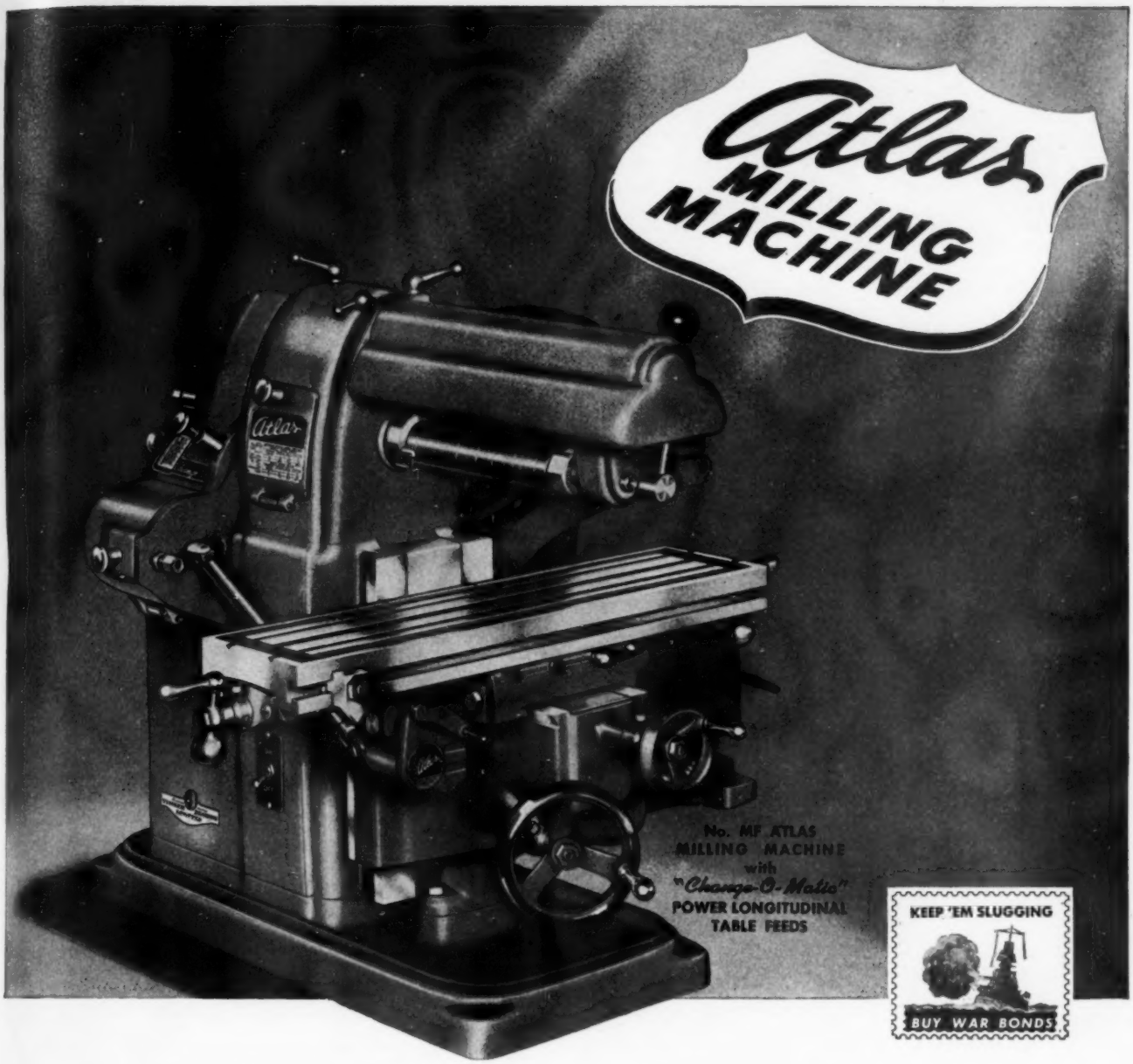

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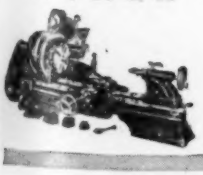

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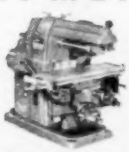

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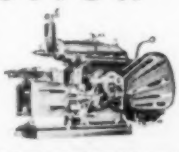

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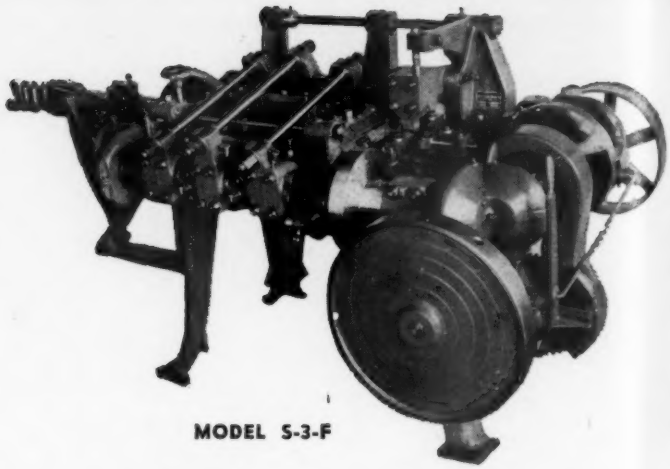

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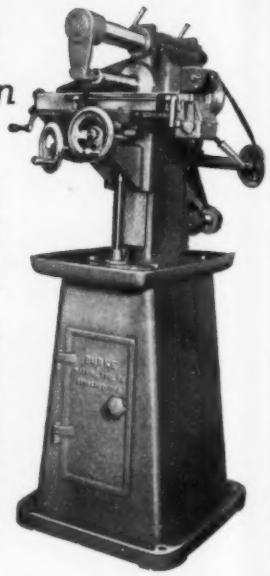


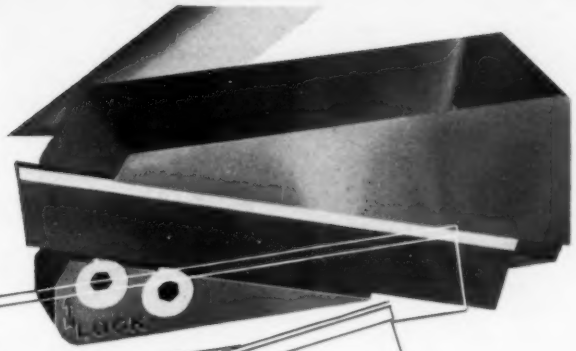
Those small, difficult jobs can be handled on a *production basis* with BURKE Motor Driven Milling Machines Nos. 1, 2, 3, & 4. Primarily, this is because BURKES have been *specially designed and built* to do smaller milling jobs efficiently and economically.

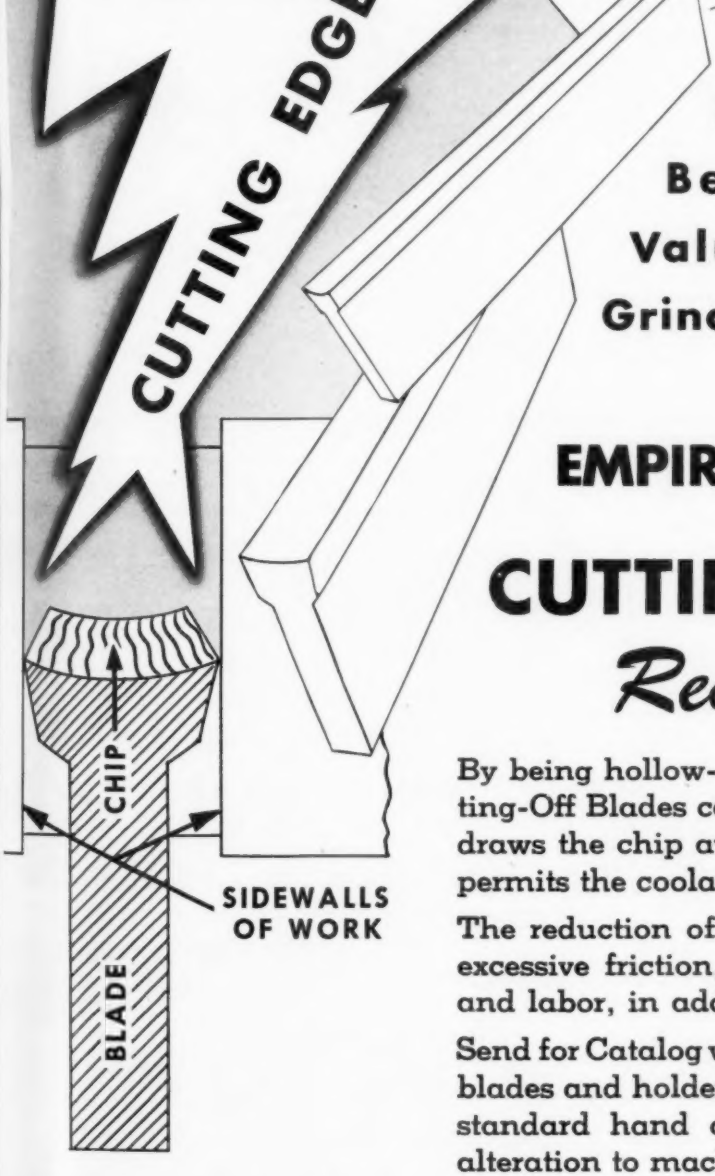
Then, too, a number of attachments are available . . . attachments that increase the units usability, and add to your productivity. These include a vertical milling attachment, index centers, and vises — 3 types, including swivel base. Now, when production must be stepped up, is the time to investigate the profit possibilities of BURKE Milling Machines, as applied to your work.

Complete Information Will Be Sent You Upon Request—Write!

BURKE MACHINE TOOL CO.
CONNEAUT • • • OHIO

HERE'S A CUT-OFF TOOL THAT LETS THE COOLANT REALLY GET TO THE CUTTING EDGE





Blade Life Increased
Better Finish Obtained
Valuable Steel Conserved
Grinding Frequency Reduced

EMPIRE TOOL COMPANY'S

LUERS PATENTED

CUTTING-OFF BLADES

Reduce Friction

By being hollow-ground the top of Luers Patented Cutting-Off Blades causes the chip to collapse. This action draws the chip away from the sidewalls of the cut and permits the coolant to reach the friction area.

The reduction of heat brings about the elimination of excessive friction, which results in savings in material and labor, in addition to giving better finish.

Send for Catalog which gives complete information about blades and holders. They are made in models to fit any standard hand or automatic screw machine without alteration to machine.

BUY WAR BONDS

PRODUCED UNDER LICENSE ISSUED BY JOHN MILTON LUERS PATENTS, INC.

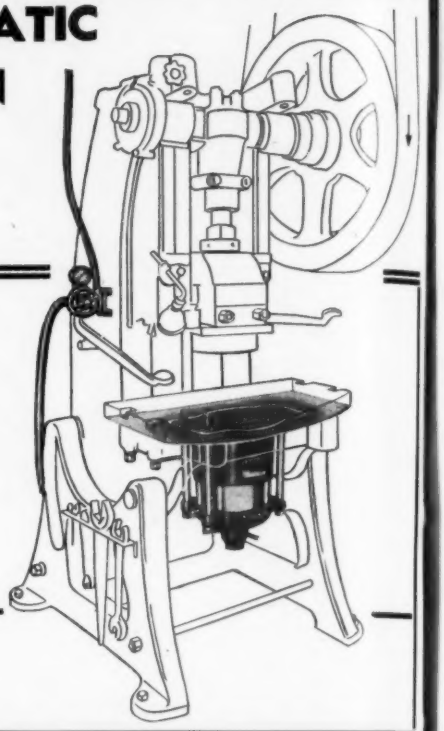
The Blades that reduce friction

EMPIRE *Tool Co.*

8778 Grinnell Ave. Detroit, Mich.

Accurate, adjustable working pressure on all dies... *assured by the* DAYTON ROGERS UNIVERSAL PNEUMATIC DIE CUSHION

No Springs—
No Rubbers—



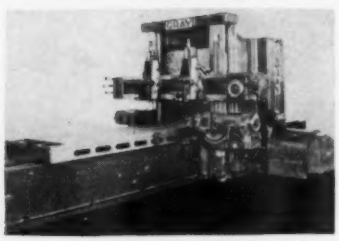
Quick installation of this Pneumatic Die Cushion and its adaptability to compound blanking and piercing dies, forming dies and *all* deep drawing dies, provides an economical and practical means to modernize your die construction.

This unit—available in a wide range of sizes—can be easily applied to any punch press. Its features are the result of more than seven years specialized experience in the design and development of various types of pneumatic die cushions. Its effectiveness, accuracy and all-round advantageous utility on a wide range of work have been definitely proved in service.

These units are furnished complete, ready for installation and are built in the following die cushion piston sizes (diam.): 6", 8", 10", 12", 14", 16". Send at once for detailed specifications.

DAYTON ROGERS MFG. CO.
MINNEAPOLIS, MINN.

THE GRAY LINE



PLANERS
MILLING PLANERS
MILLING MACHINES (Planer Type)
HORIZONTAL BORING MACHINES (Floor Type)

Write for bulletins giving detailed specifications

The G. A. GRAY CO.
CINCINNATI, OHIO

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

Giant KEYSEATERS
MITTS & MERRILL
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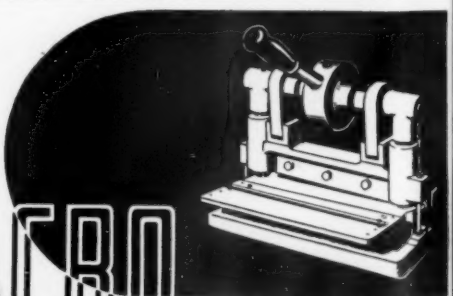
SMITH & MILLS
CRANK SHAPERS
sizes 12" to 32" stroke
THE SMITH & MILLS CO. Cincinnati, Ohio

SOLVE YOUR "SHORT RUN" DIE PROBLEMS

"Extra Special Rush! Speed it up! When can you deliver?" Maybe you don't have to wait — Wait — WAIT — for dies! Try "DIE-LESS DUPLICATING" with Di-Acro Shears, Brakes, Benders. These are *precision* machines — all duplicated work is accurate to .001". You'll get a new slant on "short-run" production problems from the great variety of parts which can be produced by Di-Acro Machines. Thousands of them are in use saving Man Hours and Critical Materials.

SEND TODAY FOR CATALOG
"METAL DUPLICATING WITHOUT DIES"
It's an eye-opener on what you can do *without* dies, shows typical parts, and gives sizes and capacities of all models of Di-Acro Shears, Brakes, Benders.

with



DI-ACRO PRECISION MACHINES
SHEAR (Illustrated) • BRAKES • BENDERS

O'NEIL-IRWIN MFG. CO. (DI-ACRO PRECISION MACHINES) 311 EIGHTH AVE. SO. MINNEAPOLIS, MINN.

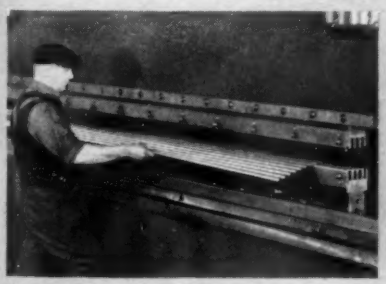
WHERE PLATE IS WELDED

A STEELWELD IS NEEDED . . .

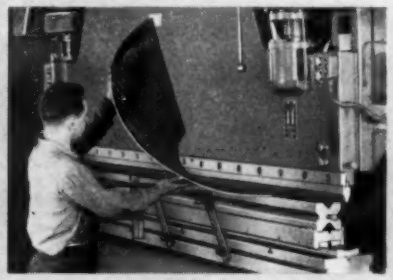
Whether you make army tanks, boilers, railroad cars, ships, machinery or airplanes, if you work with metal from 12 gauge to one inch thick, most likely you have great need for a Steelweld Bending Press.

Steelwelds are versatile tools that perform many types of work quickly and easily, whether only one piece or a production run is required. Long, sharp welded corners can be replaced by quickly made, smooth, round, bended ones, and both appearance and strength improved. Illustrated below are some of the many kinds of work that can be performed on any Steelweld.

It will pay you to investigate the many possibilities of this modern metal-forming tool that is improving product appearance and saving time and money for many enthusiastic users.



Corrugating and any straight-line production bending can be done to hairline accuracy.



Conical sections are quickly formed with standard bending dies by use of the ram-tapering mechanism.

Large diameter holes can be punched singly. Bolt holes and other holes can be punched 25 to 150 at a time.

GET THIS BOOK!
CATALOG No. 2002 gives complete construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.
1127 EAST 283RD ST. WICKLIFFE, OHIO.

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CLEVELAND

STEELWELD PRESSES

BENDING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING

TAKE THE BOTTLENECKS OUT OF YOUR COLD METAL SAWING OPERATIONS

Cut your 3 inch and larger stock on the PORTER-McLEOD *and save time*

This new machine provides an economical means of handling your cutting off operations on a high production basis. More cuts, greater accuracy and lower operating and maintenance costs are outstanding advantages offered you by the 8" Porter-McLeod Cold Metal Sawing Machine.

This machine is recommended for general work and for production work in single or multiple units. Its capacity permits of "nesting" bars and shapes using the Porter-McLeod systems of "multiple or interchangeable nests" which provide support for each nest on both sides and bottom. By this method of nesting of bars and shapes, multiple units can be cut at one time and work speeded up.

Ability to cut stock from 3 inches and up at high speed and with straight cuts is made possible by the Porter-McLeod method of pulling the blade upward through the stock and by supporting the blade, front and back on diameters well out from the center where support is needed.

These and other outstanding valuable features are fully described in engineering bulletin available on request. Send for your copy TODAY!

PORTER-McLEOD MACHINE TOOL CO., INC.

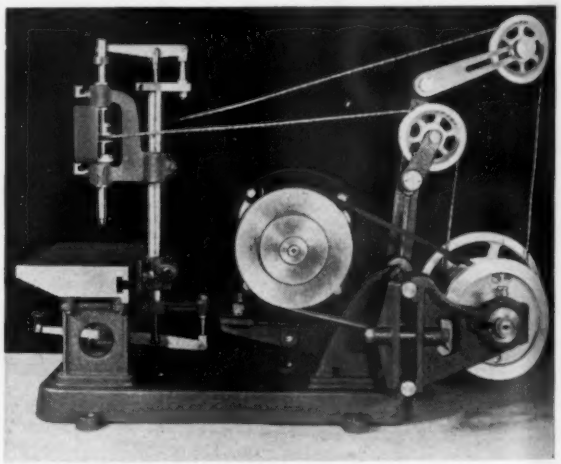
HATFIELD, MASS., U. S. A.

MACHINE TOOL COMPANY

PRECISION PRODUCTION at 23,000 R.P.M.

with the Super Sensitive

L & D HIGH SPEED DRILL PRESS



The L & D High Speed Drill Press is a precision production tool for work requiring drilled holes from .004" to 1/16" in diameter. Extreme sensitivity is obtained by balancing the spindle by means of the vertical component of the belt tension. This transmits the "feel" of even the tiniest drills directly to the finger-tip control.

The precision spindle is perfectly balanced so that absolute accuracy is maintained over long life, and drill breakage is kept at a minimum.

Eight speeds from 3,000 to 23,000 R.P.M. are standard. Machines with one, two, three or four spindles are available to suit the precision reqirements in all phases of watch and instrument manufacture.

Please send me the new L & D Super Sensitive Drill Press folder

Name ..... Title .....

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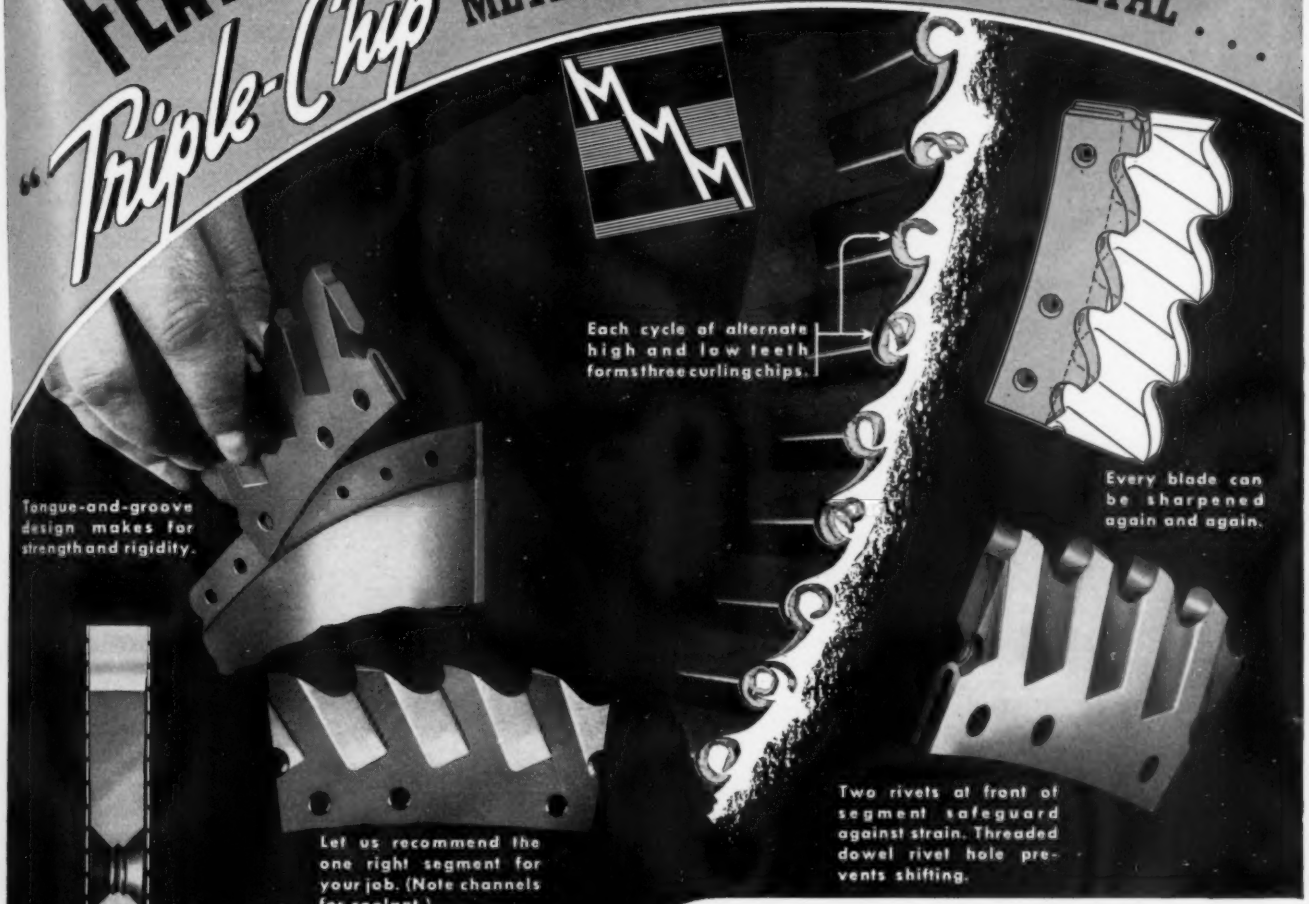
EDWARD BLAKE COMPANY

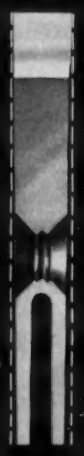
634 COMMONWEALTH AVE., NEWTON CENTRE, MASS.

BLAKE TAP GRINDERS.— FILTAIRE PORTABLE DUST COLLECTORS — AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS — L & D HIGH SPEED DRILL PRESSES

Our new "flyer" describes these and other production-raising features. Get your copy.

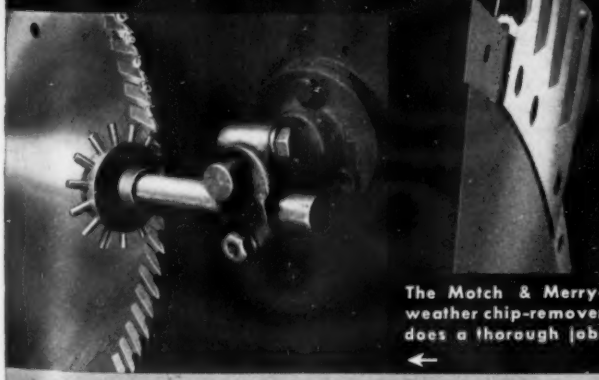
FEATURES OF THE MOTCH & MERRYWEATHER "Triple-Chip" METHOD OF COLD SAWING METAL . . .


Each cycle of alternate high and low teeth forms three curling chips.
Every blade can be sharpened again and again.
Tongue-and-groove design makes for strength and rigidity.
Let us recommend the one right segment for your job. (Note channels for coolant.)
Two rivets at front of segment safeguard against strain. Threaded dowel rivet hole prevents shifting.



Side clearance for work eliminates friction.

Projecting base of segment protects disc on side.



The Motch & Merryweather chip-remover does a thorough job.

The remarkable results achieved by the Motch & Merryweather Triple-Chip method of cold sawing metal depend, not only upon the method itself, but upon the design and construction of the blade. The features illustrated here, as well as others, have been incorporated to reflect definite cutting experience — an experience which covers not only blade manufacture, but also the building of the machine that uses the blade and the grinder that sharpens it.

THE MOTCH & MERRYWEATHER MACHINERY CO.
715 PENTON BUILDING • CLEVELAND, OHIO

Built by **MOTCH & MERRYWEATHER**

MOTCH AND MERRYWEATHER MACHINERY CO
CLEVELAND CINCINNATI DETROIT PITTSBURGH

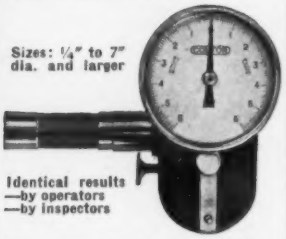
The man who does the grinding should also have COMTORPLUG

Operators, as well as inspectors, need the precision gaging of

COMTORPLUG

Automatic accuracy gaging precision bores to fractions of .0001".

Sizes: ¼" to 7" dia. and larger



Identical results
—by operators
—by inspectors

The advantages of having operators equipped with COMTORPLUG are numerous and important. With patented features that assure 2-point gaging automatically aligned and centered, this unique gage gives "inspector-accuracy" at the machine, permitting the operator to make adjustments, as needed, and materially reduce rejects. Comtorplug shows not only size, but also front or back taper, out-of-round, barrel shape, bell mouth, etc. Furthermore, its sensitive automatic "feel" assures accuracy on work gaged while still in the machine. Widely used in ordnance, airplane, automotive and similar plants.

Request Bulletin 27

THE COMTOR CO.
68 Rumford Avenue
Waltham, Mass.

your **New** "Priorities Package!"

If priorities and shortages are disrupting your packing and shipping operations, let AMESACKS do the job . . . efficiently, quickly.

With AMESACKS, you can pack small parts up to 90% faster than by old-fashioned methods.

Start using AMESACKS now and save time for your company *and* your country! Send for free samples.

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"JUST POP 'EM IN AND PULL THE STRING"

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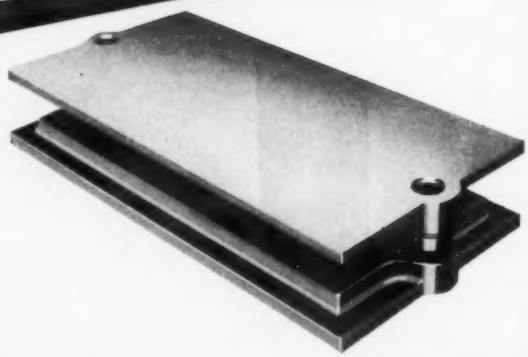
AMES BAG COMPANY
1971 EAST 66TH ST. · CLEVELAND, OHIO

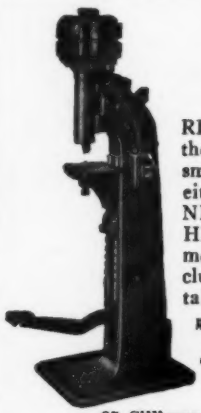
DETROIT DIE SETS ★



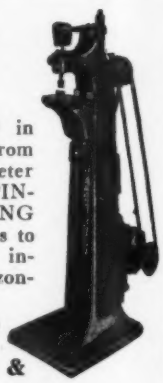
STANDARD DIE SETS and ACCESSORIES

PRECISION DIE SETS • SPECIAL DIE SETS
DOWEL PINS • SPRINGS
SOCKET-HEAD SET SCREWS • CAP SCREWS

DETROIT DIE SET CORP.
2895 W. GRAND BLVD. DETROIT, MICH.



GRANT

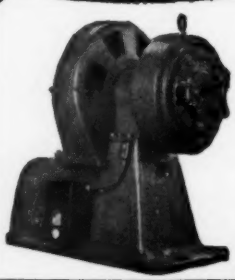


RIVETERS—PIONEERS in their line—head rivets from smallest to 5/8" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.
85 Sillman Ave., Bridgeport, Conn., U. S. A.

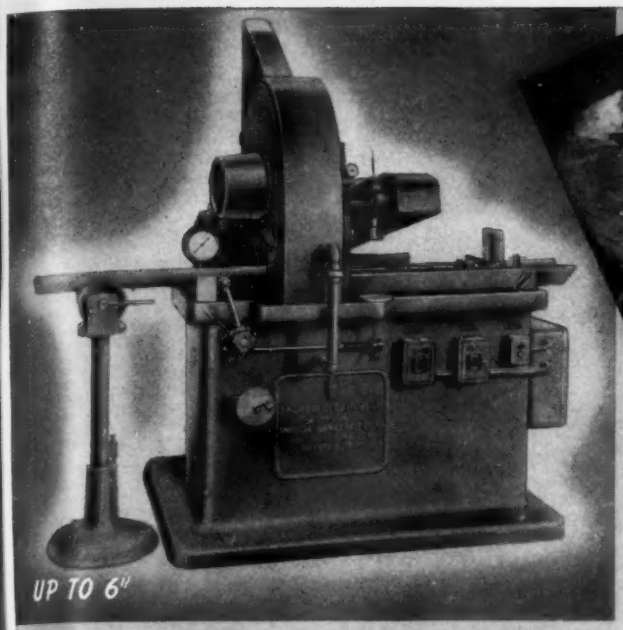
"Ask ETNA about Swaging"



• If you have a production phase that calls for tapering, sizing or reducing of solids or tubes, you can save money if you "ASK ETNA ABOUT SWAGING." The superior performance of ETNA machines assures you more pieces per hour at lower cost. Built in capacities of ⅛" to 4" . . . larger sizes built to order!

Ask for our swaging catalogs

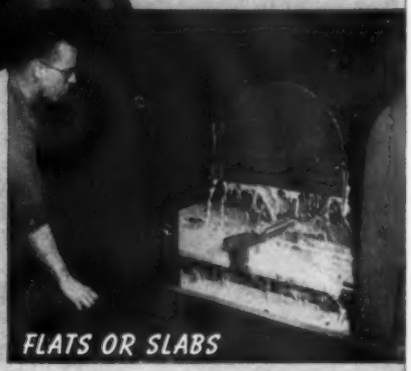
The ETNA MACHINE Co.
3800 MAPLEWOOD AVE TOLEDO, OHIO



No. 213 CAMPBELL. For cutting tubing up to and including 3½" and solids up to and including 2" dia. Features micrometer stop bar, new type work holder, automatic clamp for long and short work. Proper coolant control.

No. 401 CAMPBELL CUTAMATIC. Abrasively cuts steel up to 6" dia. Equipped with hydraulic clamping and wheel feed. Proper coolant control.

No. 302 CAMPBELL. Primarily designed for making long cuts through flat or slab materials. Hydraulic automatic reciprocating wheel feed. Proper coolant control.



FOR ABRASIVE CUTTING— CHECK WITH *Campbell*

Campbell offers 8 major types—19 different models—the only complete range of Abrasive Cutting Machines available

Whether you are cutting low carbon, high carbon, alloy, stainless, hardened, annealed, or unannealed steels; ferrous castings, non-ferrous alloys, glass, stone, ceramics, or plastics—

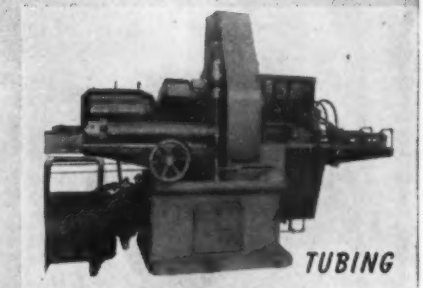
Whether you cut solid bar, tubular or flat stock—

You will find it worthwhile to check on abrasive cutting—specific jobs in your plant—with the **CAMPBELL** Engineering Department.

Send in complete data—including size and type of material, length of stock before cutting, length of cut-off pieces, production required per hour. With that as a foundation, the Engineering Department can work out production procedures and costs for your specific jobs—and offer help in other ways. Check with **CAMPBELL** on abrasive cutting problems.

ANDREW C. CAMPBELL DIVISION
BRIDGEPORT, CONNECTICUT

AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT • CONNECTICUT



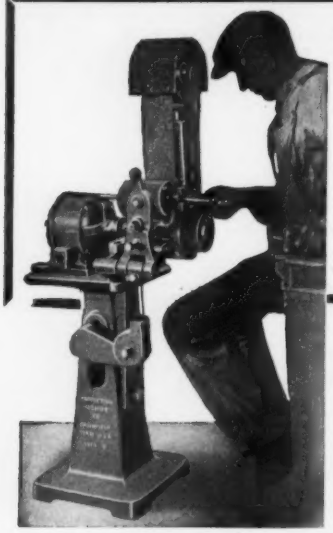
No. 425 CAMPBELL TUBE CUTTER. Specially arranged for tube cutting: A rotary machine for cutting long length tubing up to 9" diameter into short pieces, such, for example, as those used for ball-bearing races. Proper coolant control.

Campbell
NIBBLING MACHINES

If you have the problem of cutting odd shapes of ferrous and non-ferrous metals, or other composition sheets economically—or if your problem is the production of similar parts in quantities up to several hundred where the cost of dies is a prohibitive factor—Campbell Nibbling Machines will put an end to all such production bottle-necks.

CAMPBELL No. 250 NIBBLER

High speed production unit that handles up to ¼" mild steel (3/16" stainless) in widths to 72". Note two hand control. 3 speeds. Adjustable stroke. Eight other models.



Machine in vertical position for handling cylindrical work.

"PRODUCTION"

TYPE S

(Centerless Type)

POLISHER

and

FINISHER

A handy machine for cylindrical or flat work

This machine combines a centerless feed polishing machine with a vertical or horizontal finisher and is ideal for cylindrical or flat work. It can be used for anything that can be ground or polished including such materials as metals, rubber, fibre work, etc.

It can be quickly changed from horizontal to vertical position, and will handle cylindrical work from ¼" to 1" diameter automatically with centerless feed attachment.

Abrasive belt 4" wide; belt speed 3200 f.p.m.; table 4½" wide by 13½" long.

Write at once for detailed information

PRODUCTION MACHINE CO.

Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.

GREENFIELD, MASS., U. S. A.

DIAMONDS *for Victory*

CENTERLESS GRINDING WHEEL (Template Dressing)

30° ANGLE-SET Attachment to Dress 2" Radius from Template

SPEED PRODUCTION Improve Finish

Only $10.00 Extra. Requires only Common Quality Diamonds. BIG-HED Nibs to fit $12.00 per carat (3 to 4 carat size RE-SET-ABLE recommended).

LOC-KEY-SET Rotate Nib to Sharpen

Enables bullet nose grinders to use common quality diamonds to dress form wheels by dressing from 1" to 6" radius with the ANGLE-SET. Mean fixed position of nib prevents wear of setting and eliminates hazardous use of thin diamonds.

Send specifications and prints for prices on turning and boring form tools.

DIAMOND TOOL COMPANY, Not Inc.
Sheldon M. Booth, Pres.
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Carbide and Diamond-tipped
GAGES AND TOOLS
GUARANTEED QUALITY

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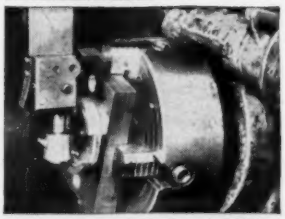
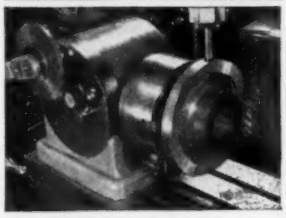
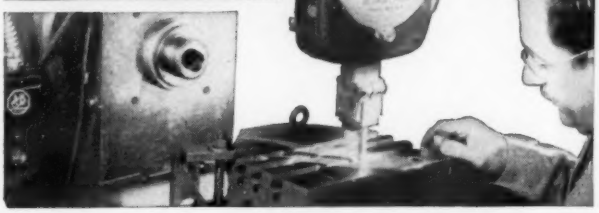






4 of the many ways SLOTMASTER can be used to save TOOLS & SETUPS

(a) Left: Set-up for cutting a spline in an adapter

(b) Below: Set-up for cutting an internal gear

SLOTMASTER can be used on any round or flat-on round over-arm milling machine and will do precision work that normally requires a multi-thousand dollar machine (all of the working parts are of tool steel, heat treated). It takes but little time to change over from one head to the other . . . the stroke of the ram is adjustable from 0 to 4" . . the speeds range from 50 to 250 s.p.m. The tool holder is of the clapper box type and can be turned in any position. SLOTMASTER comes complete with pulleys, motor, mounting bracket etc.

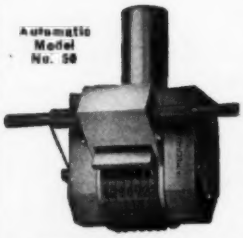
Send for 4-page catalog—give specifications of the milling machines you wish to equip. Immediate deliveries on high priorities.

EXPERIMENTAL TOOL & DIE COMPANY
12615 Greiner
Detroit, Michigan

(c) Below: Conventional set-up on a round over-arm milling machine—thumbnail shows a set-up for shaping a feed cam.

NUMBERALL Numbering Machines

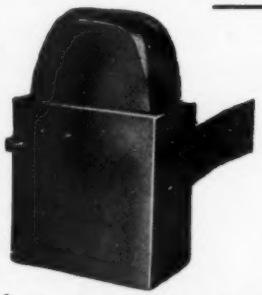
For stamping into metal etc.



Sturdy construction, precision build, perfectly aligned numbers.
All sizes of figures.

Write for Catalog.

NUMBERALL STAMP & TOOL CO., Inc.
Huguenot Park, Staten Island, N. Y.



SAFETY

(Reg. Trade Mark)

BOX TYPE HOLDER

For Serial Numbering

- More Safety!
- More Service!
- More Efficiency!

Box levels holder, thereby assuring more even impressions. Made for marking Flats, Squares, Rounds, and Shapes. Safety Steel construction eliminates spalling and mushrooming.

Write for Literature

M. E. CUNNINGHAM CO.
95 E. Carson Street Pittsburgh, Pa.

The Red Cross has Problems like your own

—*of Planning*

Your Red Cross operates a vast planning program to enable it to be ready for any disaster or emergency anywhere—whether it comes in the Americas, Europe, Australia, Asia, or Africa.

—*of Organization*

Your Red Cross is responsible for the smooth operation of 3,750 chapters and 6,000 branches, all engaged in the same enterprise of helping all who need help.

—*of Personnel*

Your Red Cross has tripled its staff since Pearl Harbor and has had to enlist the aid of and train over 6,000,000 volunteers in the principles of First Aid, Water Safety, Accident Prevention, Home Nursing, Nutrition, Nurse's Aideing, Mass Feeding, Motor Mechanics, and other subjects allied to our country's war effort.

—*of Production*

Your Red Cross is not only one of the world's foremost purchasers of supplies, but it has the immense distribution job of collecting millions of items from 10,000 different communities in the United States, assembling and storing them, and then shipping them to practically every country in the world. Last year your Red Cross shipped some $60,000,000 worth of food, clothing, and medical supplies to over 20,000,000 homeless people in foreign countries.

—*of Finance*

Your Red Cross, whose war-time and post-war expenses will run well into hundreds of millions, must account to the public for every penny it collects and puts to work. Its accounts are audited annually by the U.S. War Department.

The Red Cross faces the same problems as are in your business. With your support it can successfully meet them.

The Second War Fund is greater than the First, but no greater than the increased needs.

Business men can help with time and with money, as organizations and as individuals.

March is the Red Cross month . . . Cooperate with your Red Cross Chapter.

Your Dollars help make possible the

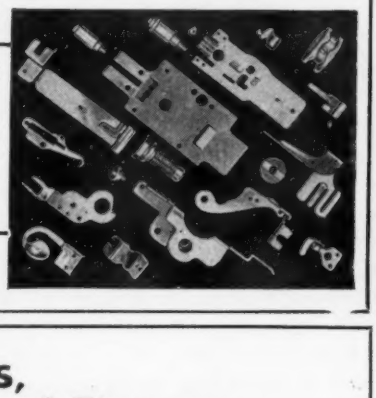
AMERICAN RED CROSS

This space contributed by American Machinist

CONTRACT WORK

Advertisements on this page are placed here by well-known concerns doing work on a contract basis. When you need assistance write to these established manufacturers.

STAMPINGS AND ASSEMBLIES
IN ALL KINDS OF METALS



Fast and efficient service on long or short runs is guaranteed by our modern equipment and methods, backed by 50 years of experience.

We also offer facilities for the manufacture of screw machine products, tools, dies, jigs and fixtures.

Quality work by skilled mechanics is assured. Send your blueprints or samples today!

"GREATER SAVINGS WITH GREIST"

THE GREIST MFG. CO.
546 BLAKE ST. NEW HAVEN, CONN.

METAL STAMPINGS
• TOOLS • DIES •
PERMANENT MAGNETS
HEAT TREATING
THOMAS & SKINNER
STEEL PRODUCTS CO.
1103 E 23rd St INDIANAPOLIS, IND

• Machines and Parts, • Special Tools and Fixtures, • Cam Milling, on Contract

Your engineering problems will receive efficient and economical service in our modern plant manned with skilled workers. Contact us today for prompt quotations on your blueprints or samples.

Designers and builders of wire and ribbon stock forming machines.

THE A. H. NILSON MACHINE CO., BRIDGEPORT, CONN.

SUB-CONTRACT FACILITIES FOR

Hand screw machine products

Engine and bench lathe, milling and drill press work.

Small sheet metal fabrications to closer than commercial tolerances.

Stampings.

We do our own tooling.

RELIANCE MACHINE & MFG. CO.
Thirty Irving Place New York City
36 years experience in metal fabrication

KIRK & BLUM

CONTRACT MANUFACTURING
ACCURATE SHEET STEEL
STAINLESS STEEL, MONEL OR
OTHER ALLOY FABRICATION
OUR SPECIALTY
CAPACITY 3/8" AND LIGHTER

THE KIRK & BLUM MFG. CO.
2823 SPRING GROVE AVE. CINCINNATI, OHIO

MACHINE SHOP

Facilities include 9" South Bend Bench Lathe, #2 Brown & Sharpe Milling Machine, Drill Press and 8"x8" Shaper. The usual line of hand tools and equipment plus experienced workmanship assure your satisfaction. Your inquiries invited.

C. VANDEGRIFT CO.
HOCKESSIN DELAWARE

DESIGN & BUILD JIGS, FIXTURES & GAGES

REED MACHINE & TOOL ENG.
BOX 662
PAWTUCKET, R. I.

COMMERCIAL HEAT TREATING

Seasoning of Steel, Nitriding
Centerless, Broach, Thread Grinding
Magnaflux & Optical Testing
Metallurgical & Chemical Laboratories
Cadmium & Hard Chrome Plating

AGERSTRAND CORPORATION
Muskegon, Michigan

CENTERLESS GRINDING

Straight, Cylindrical, Shoulder, Profile, and Multiple Diameters . . . Ground Taper Pins

Screw Machine Products. Heat treated and ground if necessary. Improved and expanded facilities insure prompt and accurate service.

Send blueprints or samples for estimates.

PORTER MACHINE CO.
3139 Enyart Ave., Oakley, Cincinnati, Ohio

Gray Iron and Semi Steel Castings also alloyed with nickel, chrome, and molybdenum. Wood, Iron, Brass and Aluminum pattern work.

KING FOUNDRIES, INC.
Phone 823 North Wales, Montg Co., Pa
22 Miles from Philadelphia, Pennsylvania

WIRE AND METAL SPECIALTIES

In round, flat, square and special shaped wire in all metals.

LARGE PRODUCTION CAPACITY

Plating and finishing.

EASTERN TOOL & MFG. CO.
BLOOMFIELD, N. J.

If you need
SCREW MACHINE PRODUCTS

write American Machinist's Contract Work Department for names of established manufacturers. If you make screw-machine products, you will find an advertisement on this page a profitable investment. Write today for complete details.

FORGINGS

• All types up to 6,000 lbs. Smooth Forged—Finished—Rough Turned, Hollow Bored and Heat Treated to Specifications. Crank Shafts—Shafting—Connecting Rods

BAY CITY FORGE CO.
ERIE PENNSYLVANIA

PATTERNS in WOOD and METAL

For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY

Put your pattern problems up to us—we will take care of them.

GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

POSITIONS VACANT

These Positions Vacant advertisements are published subject to agreement by the advertisers not to consider applicants now employed on war work unless they obtain written release from present employer.

MECHANICAL ENGINEER with extensive gear manufacturing experience for war plant. Wonderful opportunity for well qualified man. Write stating age, draft status, educational background, names and addresses of former employers. P-506, American Machinist, 330 W. 42nd St., New York, N. Y.

WANTED: First class engineer experienced in Machine Tool Design; practical experience desired. For man who can assume responsibility this is a good opportunity now and after war. P-512, American Machinist, 330 W. 42nd St., New York City.

DESIGNING ENGINEER: Mechanical or Hydraulic with about 10 years experience. Should have at least 5 years experience in special machine design or 5 years experience in hydraulic design as applied to presses or machine tools. Send photograph and full particulars including salary desired. P-533, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

EXPERIENCED MACHINE tool salesman, familiar with turret lathes and other machine tools for the New York District. Send detailed reply which will be held in confidence. Opportunity for the right man. P-532, American Machinist, 330 W. 42nd St., New York, N. Y.

WANTED: First class practical machine tool designer. This is good opportunity now and after war for man who can assume responsibility. P-526, American Machinist, 330 W. 42nd St., New York, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS — $2,500 to $25,000. Thir advertising service of 33 years recognised standing negotiates for positions of calibre indicated. Procedure individualized to your personal requirements. Retaining fee protected by refund provision. Identity covered. If salary has been $2,500 or more send for details. R. W. Bixby, Inc., 266 Delward Bldg., Buffalo, N. Y.

POSITIONS WANTED

COMPETENT AMERICAN engineer with broad experience in product design and production engineering for low costs and high production Age 57. Salary $8,000. Good teacher. Can organize, supervise, and train others. PW-529, American Machinist, 330 W. 42nd St., New York, N. Y.

EXPERIENCED MAN, 28 years in tool & die making, 17 years in training boys in machine shop practice through the practical application method, desires position as part time assistant with Detroit industrial firm carrying on a training program. Will furnish references. PW-524, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

WANTED: Position with reliable concern as foreman or superintendent. Have twenty years experience in machine tools. Am forty-three years old and married. Can give the best references. PW-535, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

RESEARCH AND DEVELOPMENT equipment engineer available. M. E. Graduate with 28 years of field exoerience embracing Product Development for chemical, petroleum, mining, food and paper industries. Would prefer a connection in Northern New Jersey or Metropolitan New York area. PW-536, American Machinist, 330 W. 42nd St., New York, N. Y.

PATENT ATTORNEYS

PATENTS, COPYRIGHTS. Booklet, "General Information Concerning Inventions and Patents" and "Fee Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N.W., Washington, D. C.

CONTRACT WORK

WORK WANTED — For advertisements of work wanted see names indexed under Contract Work in the Searchlight Section Index appearing on page Facing inside back cover.

Executives, Engineers, Chemists and Metallurgists!

Qualified men wanted for openings throughout the United States. Write for application, or submit experience record.
Inquiries solicited from responsible employers.
All negotiations confidential. Est. 28 yrs.

HARRISON PERSONNEL SERVICE
20 W. Jackson Blvd. CHICAGO

Chief Mechanical Engineer

MANUFACTURER heavy machinery, established twenty years, Dun & Bradstreet rating AAA1, engineering department of one hundred employees, doing large successful business, now exclusively on war work, has permanent opening for Chief Engineer with following qualifications:

1. Proven genius for surveying requirements of a given field, with creative mind to initiate fundamental designs and supervise work through engineering department.

2. Applicant must be American citizen, graduate mechanical engineer, age 38 to 45, and of good personality with ability to cultivate confidence. Preferably with shop experience and employed as Chief Engineer, or in responsible capacity, with first class concern in heavy equipment industry.

3. All replies will be treated in absolute confidence, and neither employer or references communicated with until have your written permission. Equal opportunity comes to few men in life time. Compensation good. Later, if worthy, can acquire interest in closely owned business, known world over, as leaders in their field and who have enjoyed signal success.

4. To have consideration, give complete abstract of business experience, age, education, present compensation, salary expected to start, number of dependents and send snapshot not to be returned.

Address **P-523** American Machinist
330 West 42 St., New York City

WANTED
FOUNDRY SUPERINTENDENT
AND
FOUNDRY FOREMAN

for gray iron and steel castings, foundry operation in Florida for duration and thereafter. Excellent post war prospects. Heavy castings for mill supplies.

P-530, American Machinist
330 West 42nd Street, New York City

WANTED
DRAFTSMAN

Competent draftsman experienced on internal combustion engines. Give full details of past experience, salaries drawn, and age, in first letter. Permanent.

P-521, American Machinist
520 No. Michigan Ave., Chicago, Ill.

WANTED

Process engineers (junior) to do general trouble shooting and help improve process of manufacture of small arms munitions. Applicants should have college training in science plus some experience in industry and mechanical arts. Should not be immediately subject to draft and preferably under 30. Location, Midwest.

P-531, American Machinist
520 N. Michigan Ave., Chicago, Ill.

GENERAL MANAGER WANTED

Old established Ohio plant employing 300 to 400 —designing and manufacturing jigs, fixtures, dies, special machinery and production machining, ordnance and aircraft parts, desires a man knowing tooling, processing, estimating and general machine shop practices.

Permanent position. Excellent opportunity for competent producer. Salary open. State age and complete experience in first letter.

P-522, American Machinist
520 N. Michigan Ave., Chicago, Ill.

WANTED
CHIEF ENGINEER

American born citizen age 35 to 60, experienced on light plants and small single cylinder diesel engines 5 to 25 h.p., whose objective is not to make the unit run but to design it so as to be competitive and easily made. Permanent position with salary and bonus if capable. Give previous positions held with dates and salaries. All correspondence strictly confidential. 100% War Work.

P-520, American Machinist
520 No. Michigan Ave., Chicago, Ill.

NOTICE
POST WAR WORK

Midwest company with modern plant, heavy cranes, railroad sidings, capital wants new ideas for manufacture or use of plant; practical for any development. Connection with company possible or other arrangements. Also interested in representing manufacturers, using plant for warehouse purposes and servicing.

BO-524, American Machinist
520 N. Michigan Ave., Chicago, Ill.

COMPLETE INDUSTRIAL PLANT WITH MACHINE SHOP

For Sale or Rent on Long Term Lease

Located on fully enclosed six-acre plot—approximately 30,000 sq.ft. under cover, steel buildings, overhead traveling cranes, railroad spur on L.V. R.R. Suitable for any type of War Industry with only slight renovations required. Especially suitable for the manufacture of heavy machine parts. Now operating and ready for immediate occupancy.

For further details phone, wire or write

Greater N. Y. Contractors Machinery & Equipment Co., Inc.
258—23rd Street Brooklyn, N. Y.
Tel. South 8-4900

NEW INVENTIONS WANTED

Mechanical and electrical devices which can be used to promote our war production program. Either new ideas, or improvements upon present methods.

P. O. Box 217, Denville, N. J.

WANTED

Several 3,000 to 4,000 pound board drop hammers.

Address P. O. Box 1944
Cleveland, Ohio

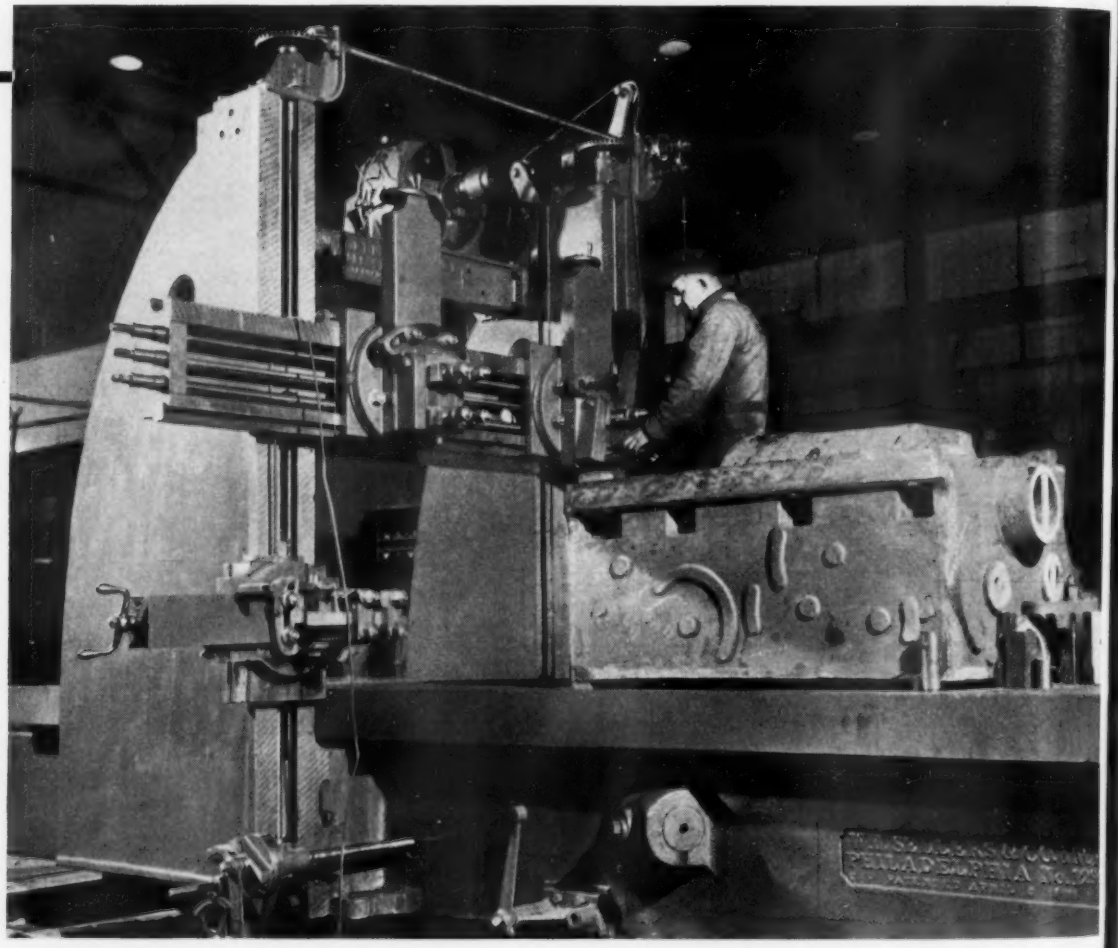
WANTED
SPEED REDUCERS
REEVES DRIVES
Any Quantity—Size—Type
Highest Cash Prices Paid
PATRON TRANSMISSION CO.
154 Grand St. New York

Don't forget the
BOX NUMBER

When answering the classified advertisements in this magazine, don't forget to put the box number on your envelope. It's our only means of identifying the advertisement you are answering.

WEAPON No. 1

IN A WAR OF METAL*



*Keep your machine tools in fighting trim by **ENGINEERED REBUILDING**

Every piece of ordnance from the blueprint to the battlefield takes shape through machine tools. Not enough metal is available to build all of the machine tools required. *Therefore, industry must make the most of those it has.* This can be successfully achieved by keeping machine tools in fighting trim, by *Engineered Rebuilding* when they need repair. • Simmons has solved machine tool rebuilding and maintenance problems for leading armament plants. Learn how we can help you. Send today for a copy of "The Simmons Way." Simmons Machine Tool Corporation, 1759 N. Broadway, Albany, N. Y.

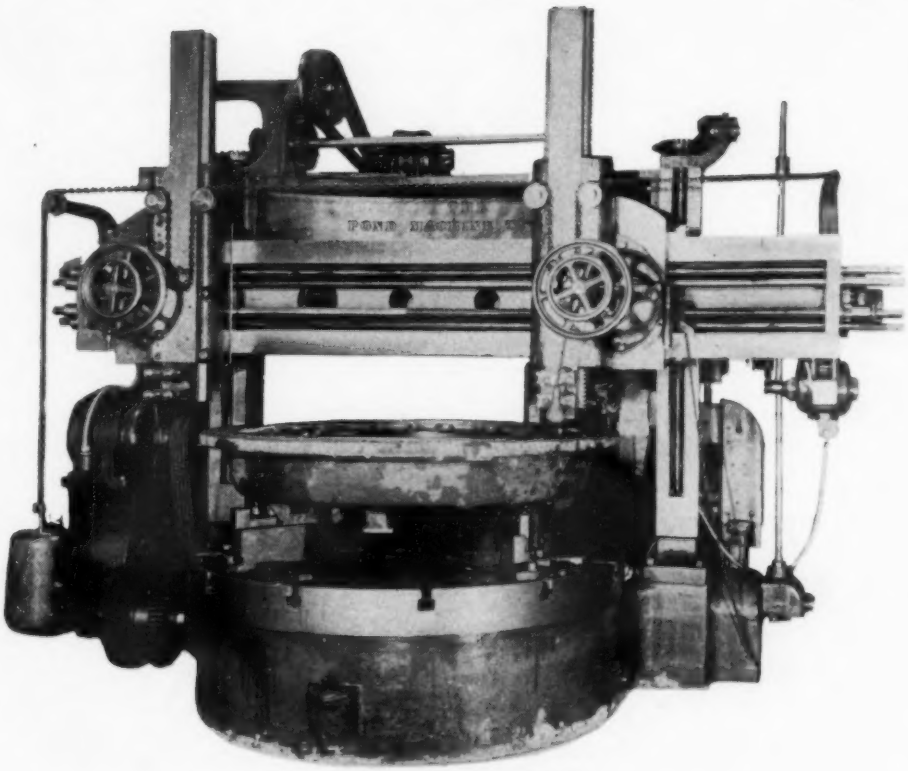
ARMY E NAVY

SIMMONS *Engineered* MACHINE TOOL REBUILDING

FALK DEPENDABLE MACHINERY

FOR IMMEDIATE DELIVERY

90" Vertical Boring and Turning Mill



Actual Swing 94-in.
2 Swivel Heads on Adjustable Rail
Height under Rail 60-in.
All Geared Feeds and Speeds

VEE Belt Motor Drive thru Gear Box is 25-H.P. G-E AC, 3-Ph. 60-Cy., 440-V., 900 RPM Motor.
Motor elevation for rail. Motor-driven Rapid Traverse to Heads.
Table 78-in. x 7½-in. Set of 4 Adjustable Heavy Duty Chuck Jaws.

Guaranteed first class mechanical and operating condition.

If Interested, WIRE, WRITE or PHONE

Buy From Stock

MACHINERY

Every Item Guaranteed

FALK
MACHINERY CO.,

18 WARD ST.

MERCHANTS

ROCHESTER, N. Y.

Tel. Main 6347

SHELL MAKER JUMPED the GUN with REBUILT MACHINERY

in PRODUCTION 2 YEARS AHEAD of TIME
ALL NECESSARY EQUIPMENT FROM ONE SOURCE

• A shell manufacturer had to produce as soon after organization as possible. There was only one quick solution—used machinery. Where? From O'Brien. O'Brien furnished, over 200 different machine tools plus operating equipment—an entire automatic department, a complete hand screw machine department, a complete forge shop, a heat treating department, a fully equipped tool room, a metal stamping shop and all air compressors, boilers, oil burners, pumps, etc. Later, O'Brien supplied a complete shell loading plant.

ONE SOURCE . . . ONE RESPONSIBILITY

A Selected List of Current Offerings — Subject to Prior Sale

BORING MILL—4" bar Newton Horizontal Cylinder Boring Mill 48" maximum cylinder.

DRILLS—5' Bickford Radial, 13" column, mtr. drive.
4 spindle Leland-Gifford B.B. Sensitive, #2 taper, tapping attachment.
16" Henry & Wright, belt drive, Sensitive B.B., #2 M.T.
16" Edlund, belt drive, Sensitive, b.b. #2 Morse T. 8 spindle Baush, belt drive, 36" diam. head #4 M.T.

GRINDERS—#6 Bryant Internal Grinder, 12" swing, belt drive
Springfield Planer Type, Surface, cap. 12"x50".
18" Gorton Disc Grinder, belt drive, two universal tables.
6"x18" Landis, plain, self-contained, motor drive
#2 Cincinnati centerless, motor drive (New 1928)

LATHES—30"x10' Bradford, belt drive, plain change.
26"-48"x16' McCabe, double spindle, belt drive, 10' centers.
23"-46"x12' Putnam Extension bed Gap Lathe, quick change, belt drive.
20"x10' American, belt drive, quick change.
20"x8' Boye & Emmes, belt drive d. b. g. quick change.
18"x14' Hamilton belt drive, quick change.
18"x12' LeBlond, belt drive, plain change gear.
16"-23"x8' South Bend Gap Lathe, belt drive.
16"x6' Pratt & Whitney, quick change, belt drive taper attachm't.
12"x5' Hendey, motorized, quick change, taper attachment.

MILLERS—#2 Brainard Plain, belt drive, table 8"x30".
Hendey "Lincoln" type Production Miller, table 9"x30", belt drive.
#1 U. S. Hand, belt drive, table 5"x20".
Newton Planer type 15" between the uprights, table 14x54

PUNCH
24" throat, Bement Single End, belt drive, cap. ⅝"x⅝".

PLANERS—24"x24"x6' Putnam, belt drive, 1 head.

SHAPERS—24" Barker, single geared, belt drive.
20" Barker, back geared, belt drive.

SHEARS—½" cap. Ryerson Rotary Bevel Shear, belt drive, 8" blades.

SLOTTERS—6" Newton, belt drive, 18" table.
10" New Haven, belt drive, 24" table.

TURRETS—#1 Foster arranged for bar work ¾" cap., belt drive

WHEEL PRESSES
200 ton Caldwell, 38" between bars, motor drive, with pump.

Everything from a Pulley to a Power House

THE O'BRIEN MACHINERY CO.

PHILADELPHIA'S LARGEST MACHINERY DEALERS AND EXPORTERS

113 NORTH THIRD STREET • • PHILADELPHIA - PENNA.

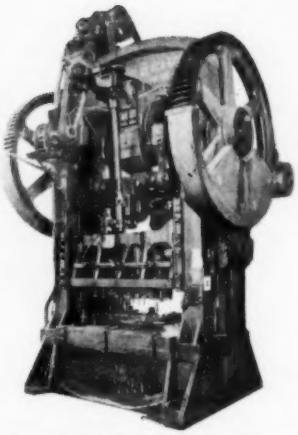
BELL TELEPHONE: MARKET 4180 CABLE ADDRESS: OBRIEN-PHILA

FALK DEPENDABLE MACHINERY

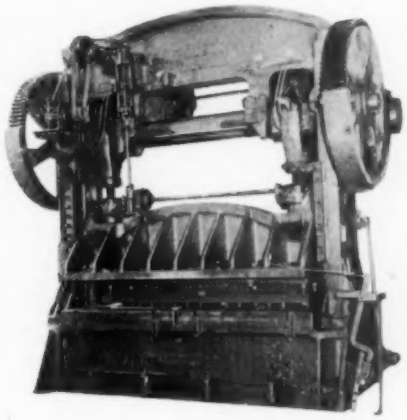
IMMEDIATE DELIVERY

MAY BE INSPECTED UNDER POWER

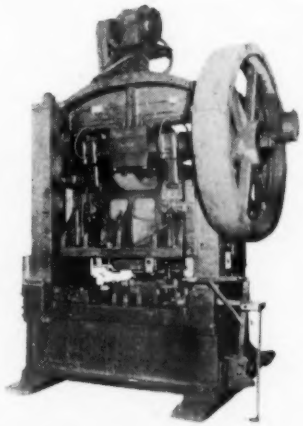
SHIPMENT FROM DETROIT AREA



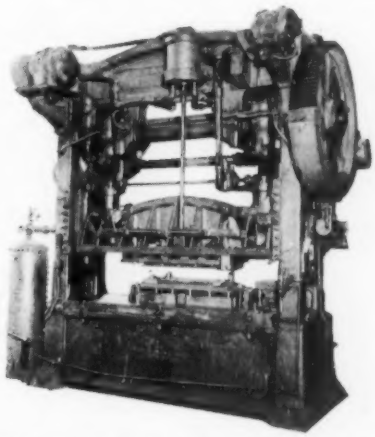
TOLEDO 96-C—Straight side, tie rod, double crank, double geared, twin geared, V-belt M.D., with 30 H.P., 3 Ph. 60 Cy. 440 V. motor & controller, separate motor for regulating ram. Forced feed lubrication, pneumatic controlled friction clutch & brake. Bed area—72"x51", 6" stroke, 18" sheet height. Marquette air cushioned bed. Serial No. S26203—375 ton press capacity, weight 115,000 lb.



TOLEDO 94½-J—Straight side, tie rod, double geared, twin geared, direct geared M.D. with 30 H.P. 3 ph. 60 cy. 440 Volt motor & controller. Forced feed lubrication, pneumatic controlled friction clutch & brakes. Bed area—120" right to left x 50" front to back. 12" stroke, 18" sheet height. Bed equipped with spring cushions. Separate motor for adjustment of ram. Serial No. S25481—approx. 200 ton press, weight approx. 80,000 lbs.



BLISS NO. 7—Straight side, tie rod, back geared V-belt M.D. with 15 H.P. 3 ph. 60 cy. 440 V. motor & controller—manual operated adjustment of ram, 175 ton press cap. Forced feed lub. Pneumatic controlled clutch & brake. Bed area 64"x37", 4" stroke, 22" sheet height, spring cushioned bed. Rebuilt by Toledo 1937. Serial No. BX9002—4877—90. Weight approx. 43,000 lb.



TOLEDO 93½-I—Straight side, tie rod, double geared, double crank, 15 H.P. V-belt motor drive—3 ph. 60 cy. 440 V. & controller. Separate motor for adjustment of ram. Forced feed lubrication, pneumatic controlled friction clutch & brake, air cy. pull back on ram. Bed area 96"x34", 6" stroke. Spring cushioned bed 18½" sheet height, weight approx. 42,000. Serial No. S26243—approx. 175 ton.

Buy From Stock

MACHINERY

Every Item Guaranteed

FALK MACHINERY CO.,

18 WARD ST.

MERCHANTS

ROCHESTER, N. Y.

Tel. Main 6347

QUICK DELIVERY EXCEPTIONAL TOOLS

SCREW MACHINES

2—2½" CONE AUTOMATICS; 4 spindles
2—⅞" CONE AUTOMATICS, 4 spindles
4" NATIONAL ACME, MODEL B, 4 spindles
2½" MODEL A CLEVELAND
2¼" NATIONAL ACME, 4 spindle; B.D.
No. 55 NATIONAL ACME; 2" CLEVELAND
No. 652 NEW BRITAIN AUTOMATIC CHUCKING MACHINES; 6 spindles; (2)
No. 2 MANVILLE, for wood screws from ⅜" to 3½"
No. 3 MANVILLE, for wood screws from ¾" to 6"

32" FARREL ROLL GRINDER

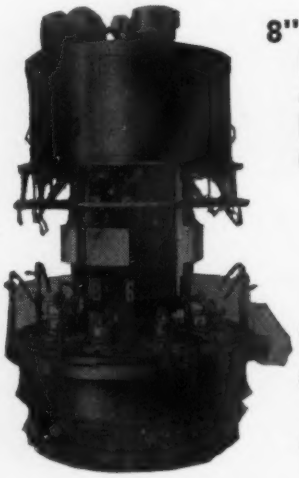
Will grind rolls up to maximum of 34" diameter; 30" grinding wheel; 10'6" bet. centers; motors & controls

GRINDERS

CYL.: 14"x72" NORTON; 10"x36" LANDIS; No. 22 LANDIS
DISC: No. 24 GARDNER VERTICAL SPINDLE HORIZ., B.B.; 53 disc; B.D.

GEAR MACHINERY

No. 36BT G & E TURRET BEVEL GEAR ROUGHER
No. 6-A CINCINNATI, 72"x20"
No. 12 BARBER-COLMAN HOBBER



8" & 6" BULLARD MULT-AU-MATICS —4 & 6 stations; Direct motor driveless motor.

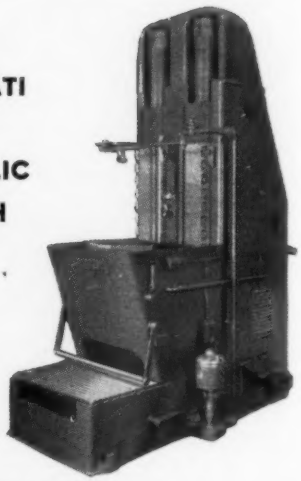
VERTICAL BORING MILLS

51" BULLARD; 51½" swing; 50" table; Back geared
52" NILES BEMENT POND; 53" swing; 51½" table; Motor Drive
48" ROCKFORD; 3 spdles., 48" rotary indexing table;

BORING MACHINES

SNYDER TWO WAY HORIZ.; 2 heads on each side; Hyd. drive; M.D.; 2 SPINDLE FOOTE BURTE, B.D.

No. 2-48 CINCINNATI 2-SPINDLE VERTICAL HYDRAULIC SURFACE BROACH WITH MOTORS NEW IN 1937



TURRET LATHES

GISHOLT UNIVERSALS; TIMKEN BEARINGS; HARDENED WAYS; Nos. 1-L; 2-L.
No. 6 BROWN & SHARPE HAND SCREW MACH.
No. 3-A WARNER SWASEY UNIVERSAL, M.D.
28" POND; 4¼" hole in spindle
2—No. 16 GISHOLT SIMPLIMATIC PRODUCTION LATHES; 21" swing; 16" air chuck; Belt drive

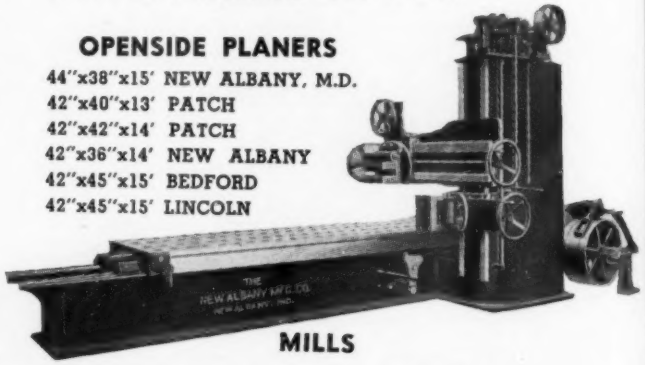
FLOOR LATHES

30' PIT LATHE; Face plate dia. 156"; Quad. Gd.; Int. face plate drive, 5½' outer support to face plate.

21"x10' RYERSON. 16"x8' MONARCH GD. HD.
26/46"x20' SCHUMACHER & BOYE
38"x20' NEW HAVEN; 26"x18' DRAPER B.G.
24"x15' NEW HAVEN, LCG, Back geared
20"x10' & 18"x10' BRADFORD; 10"x4' BARNES
20"x8' & 18"8' MONARCH; 10"x5' P. & W.

OPENSIDE PLANERS

44"x38"x15' NEW ALBANY, M.D.
42"x40"x13' PATCH
42"x42"x14' PATCH
42"x36"x14' NEW ALBANY
42"x45"x15' BEDFORD
42"x45"x15' LINCOLN



MILLS

No. 2 B & S and No. 2½-B K & T VERTICAL
No. 2 B & S and CINCINNATI UNIVERSAL
Nos. 2 & 3 CINCINNATI PLAIN; 18" CINCINNATI DUPLEX
24" CINCINNATI AUTOMATIC, M.D.; 18" CIN. AUTO. (2)
No. 45 PRODUCTOMATIC; No. E-3 KELLER DIE SINKER
No. 3 LEES-BRADNER THREAD MILLER
10" PRATT & WHITNEY SEMI-AUTO. PROD. MILL

INTERSTATE MACHINERY CO., INC. Tel. Yards 5800
1439 W. PERSHING RD., CHICAGO, ILL.

SIZES AVAILABLE

10x36
10x50
10x72
14x36
14x50
14x72
14x96
16x50
16x72
18x96
21x168

●

We can now Modernize and Motor a limited number of your NORTON Grinders.

MICRO-FINISH WITHIN PRECISION LIMITS WITH STANDARD GRAIN WHEELS

assured by

HILL-CLARKE *Modernized Motor Driven* CYLINDRICAL GRINDERS

Refinements incorporated by Hill-Clarke in these machines assure precision, minimum vibration and a finish which requires no extra grinding time. Even when using standard grain free-cutting wheels, these machines can be depended on for super-grinding and micro-finish.

Among the modern features offered in these machines to insure performance which meets today's exacting demands are the following Hill-Clarke developments.

. . . Multiple V-belt drive from constant speed motor to work head.

. . . an accurately fitted wheel slide having a ball bearing mounted feed screw—a refinement which assures sensitive wheel control and makes possible the duplication of work to extremely close limits.

. . . sheaves and motors dynamically balanced to insure smooth, vibrationless performance.

. . . mounting of coolant pump on a separate multiple compartment settling tank as a further means of eliminating vibration.

Other details of design and refinements are fully covered in illustrated bulletin "Super Grinding"—available promptly on request.

HILL-CLARKE MACHINERY CO. CHICAGO U.S.A.

HILL-CLARKE MACHINERY CO.

649 WASHINGTON BOULEVARD — CHICAGO, ILL.

PHONE: HAYMARKET 7660 — CABLE ADDRESS "REMAND"

USED and REBUILT MACHINERY FOR SALE

LATHES
Adams 14 x 5' Geared Head
Davis 14 x 6' Q.C.
Hendy 14 x 6' M.D. Taper Attachment
Lodge & Shipley 16 x 8' Q.C. M.D.
South Bend 16 x 10' M.D. Q.C. Taper Attachment GAP
Sidney 17 x 8' M.D. D.B.G. Taper Attachment

TURRET LATHES
Gisholt—21"—2" thru spindle
Gisholt—5¾"—2" thru spindle

GEAR CUTTERS
G.&E. 3x36" Spur
G.E.E. 36"

DRILLS
Foote-Burt Heavy Duty
Eberhardt—24". Sliding Head

GRINDERS
Modern—16" x 60" M.D.
2—#3 Diamond M. D. Surface

MILLERS
1—#3 Garvin Duplx, Table Cap. 12 x 64"
1—#2 Cincinnati Plain Miller, with dividing head
#12 B & S
18" Cincinnati, Vertical
12" Cincinnati

SHAPERS
1—10" G & E M.D.
1—24" Rockford, M.D.

BORING MILLS
4" Single Pulley Driven — Bickford Horizontal
2" Binsee, Horizontal
40" Bickford, Vertical

AUTOMATICS
1—#53 National Acme
1—2¼" Gridley Single Spindle
1—1¼" Gridley 4 Spindle, Model G
1—2¼" Gridley 4 Spindle M. D.

GENERAL
66E Niagara Power Press
American Planer—36" x 36" x 8', 2 Heads on Rail M.D.
George A. Ohl Power Shear—10' 14 Gauge
#17 Williams & White Heavy Duty Punch, M.D. 36" Throat
10", 12" and 14" Newton Slotters
16" Beasley Ball Bearing Grinder
3—Form Rolling Machines (5 Sets of Form Rollers
1—Heller Motor Driven Cold Saw with 24" Blades and 1 Machine to Grind Saws for Same
Thompson Spot Welder—50 KVA Air Operated
Hydraulic Wheel Press with Pump, 150 Tons
Schatz Angle Shear—4 x 4 x ⅝"

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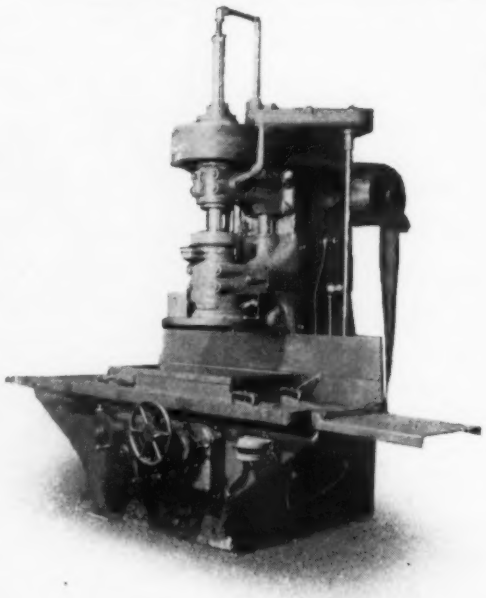
SURFACE GRINDERS



For immediate delivery!

PRATT & WHITNEY SURFACE GRINDER
Vertical spindle equipped with Timken bearings; segment wheel 22" in diameter; table working surface 22" x 48"; with Taft-Peirce chuck, size 22" x 48", motor generator set, motor driven pump and tank, 30 horsepower motor for wheel spindle (as illustrated).

DIAMOND HEAVY DUTY FACE GRINDER
Segment wheel 30" in diameter; table working surface 24" x 84" with 84" power feed; maximum height of work 24⅜"; with silent chain motor drive to spindle.

We have hundreds of machine tools in stock; please tell us what you need, maybe we can help you.

The **INDIANAPOLIS MACHINERY & SUPPLY Co.,** *Eastern Branch & Export Office:* **44 Whitehall St., New York City**
INDIANAPOLIS, INDIANA, U. S. A.
New, Used and Rebuilt Machine Tools . . . Steel . . . Mill and Industrial Supplies, Electric Motors Etc.

It will pay you to look through this list of good machine tools

AUTOMATICS

5½" Cleveland Model A
14"x19" Fay
No. 6A Potter & Johnston
4½" Gridley model H
6"x6¾" Goss & DeLeeuw
1" Cleveland "1" double end
No. 16 Gisholt Simplimatics
1⅝" No. 55 National Acme
7" Baird 6 spindle

BROACHES

Nos. 1, 3 and 4 LaPoint screw
No. 3 LaPoint double screw
No. 2 Standard screw press
2 ton American rack vertical

BULLDOZERS

No. 1 Rock River, 5½"x32" cross head
No. 29 Williams & White, 16"x90" cross head

DRILLS

15" & 20" Buffalo
20" & 22½" Barnes
16" Sibley
20" Lindgren
20" Silver
23" Mechanics
20" No. H 2 Barnes Hydrau.
24" No. H 3 Barnes Hydrau.
21" Cincinnati
Natco multiple Nos. 11, 12, B12, C12, 14 and 32, 8 to 62 spindles
No. 1 Baush multiple
No. 13 Pratt & Whitney multiple
Nos. 15½D and 15½F Foote Burt manufacturing
No. 8H Natco hydraulic horizontal multiple
Nos. 0 and 00 Garvin duplex
4'x72" Sundstrand centerer.
4" Hammond radial
Sensitive drills. Almost all makes and sizes
Barnes vertical hydraulic feed drilling, boring & reaming
Edlund semi-special 3 motor production drill

GEAR MACHINERY

No. 16 HS Gould & Eberhardt hobber
No. 12 Barber Colman
No. 1 Lees Bradner
26"x48" Brown & Sharpe automatic
24" Flather automatic
36" Gould & Eberhardt automatic
60" No. 5A Cincinnati automatic
18" Gleason testers & lappers
15" Gleason spiral gear roughers
Gleason spiral pinion rougher
18" Gleason bevel generator
2 spindle Lipe chamferer
Pratt & Whitney worm grinder
National gear checker

GRINDERS

10x36 and 10x50 Norton
12x36 and 12x52 and 16x48 Landis Capitol internal
Nos. 6 & 15A Bryant internal
20"x50" Safety surface
Nos. 50 & 60 Heald cylinder
18" & 24" Gardner disc
24", No. 84 Gardner opposed disc
24" No. 221 Hanchett opposed disc
No. 120A Gardner opposed disc
17"x36"-48" Norton hydraulic crankshaft
Gisholt tool grinder
24" Ingersoll tub type
30" Ransom elect. snagging
16" Norton snagging
No. 575 Hawes tub polisher
18" Whitney wet tool
36" No. 5TGM Bridgeport wet
Cincinnati face milling grinder
Pratt & Whitney grinder for worms or threads
Gear Grinding Mach. Co., radius grinder
Gould & Eberhardt gear cutter grinder

PLANERS

24"x24"x5' Gray
24"x24"x6' Woodward & Powell
29"x29"x6' New Haven
36"x36"x10' Betts

LATHES

28" Steinle, 8" hole
24" Gisholt
24" Steinle, 3-9/16" hole
22" Libby, 4½" hole
2¼x24 & 3"x36" Jones & Lamson
No. 1, ⅝" capacity hand screw
No. 3 Woods turret
No. 4 Foster
13"x6' Automatic threading
Melling crankshaft 6 cylinder
3½"36" Lo Swing
4" Lo Swing
27"x14' Bridgeford heavy turning or axle
8" Sundstrand stub
9" Sundstrand Mfg.
1"x18" Pratt & Whitney automatic
14"x6' Lodge & Shipley with turret on carriage
22"x124" American with turret slide

MILLING MACHINES

No. 3 Turnmilling for round work
Nos. 1 & 1A Davis & Thompson drum type duplex
48" Oesterlein tilted offset
Nos. 10 & 45 Productomatic
8" and 12" Pratt & Whitney automatic
Model AB Becker vertical
Type D Hall planetary thread miller
Taft Pierce internal thread
28" Cincinnati Duplex
3⅞" Beaman & Smith horizontal

UPSETTERS AND FORGING ROLLS

2" National steel frame
2½" Ajax steel frame
4" Ajax steel frame
No. 1A Ajax taper forging rolls

SHAPERS

36" Morton draw cut

PRESSES

Nos. 1, 2 & 3 Toledo OBI
No. 20B Bliss OBI
No. 3 Niagara OBI
No. PA3 Ferracute
Nos 14½ & 41A Toledo horning
Nos. 6 & 6½ Wat. Ferrel gap
No. 76 Toledo gap frame
No. 38½ Bliss straight side
No. 53 Toledo straight side
No. 8-7 Zeh & Hahnemann S.S.
No. 7 Rockford straight side
No. 3 Bliss Stiles punching
No. 2 Standard screw type
28", No. 71 Swaine dbl. cr.
36" ACF double crank
No. 6A Bliss cam drawing
No. 180 Toledo toggle drawing
No. 796¼ Toledo double crank toggle drawing, 108" bet. upr.
300 ton Shaffer hydraulic wheel
750 ton Baldwin Southwark triple action hydraulic toggle, 142½" between uprights

SHEARS & SHEET METAL

20" Pels beam
2" Newbold guillotine
1½" Lewis alligator
1¾" Hilles & Jones alligator
No. 180 Tessmer sprue cutter
No. 3 Pawtucket
9hl press brake
10'x8" dia. crank
No. 352 Toledo band roll
2M Pettingell hammer
⅜"x3' Shuster wire straightener & cutter
Sleeper & Hartley casing coiler
No. 5 Sleeper & Hartley spring coiler
No. 3 RH Magee Wirer

MILES MACHINERY COMPANY, Saginaw, Mich.

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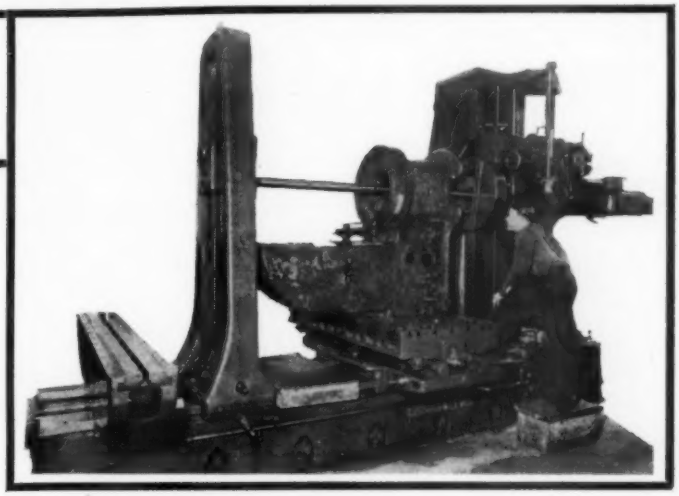
. . . to help you solve your Production problems IMMEDIATELY



Worn out Vertical Boring Mill in one shop in process of being rebuilt — an example of the work involved in conditioning usuable machine tools for war production.

Partial list from our large stock of machines

MILLERS:
1—Pratt & Whitney 6" x 48" Thread Miller.
1—Pratt & Whitney 12" Automatic Millers with receding tables.
1—Brown & Sharpe #12 Manufacturing Miller. Working surface 29 x 6" Overarm 3⅜".
1—Cincinnati 28" Plain Miller—Semi-Automatic with Intermittent Feed and Power Quick Return.

UPSETTERS:
1—National 4" Heavy Duty Upsetting Machine.
1—Ajax 4" Upsetting Forging Machine.

LATHES:
1—6" x 108" Lo-Swing Lathe—2 carriages.
1—6" x 132" Lo-Swing Lathe—Steel ways—2 carriages.
14" and 16" x 6' and 8' bed QCG Lathes.
1—Johnson 30 x 24 Triple Geared QCG Lathe.
1—Sellers #709 Engine Lathe. Swing 36" x 19'.
1—Bridgeford 26" x 12 Heavy Duty M. D. DBG QCG Engine Lathe.

HAMMERS:
1—E. W. Bliss 600-lb. Board Drop Hammer.
1—Bradley 80-lb. Rubber Cushioned Helve Hammer.
1—Bell 600-lb. Steam Hammer and base.
1—Chambersburg 1200-lb. Hammer.

DRILLS:
1—Fosdick Machine Tool Co. 5' Full Universal Radial Drill.
1—Aurora 35" Sliding Head Upright Drill.
1—Prentice 36" Upright Standard Pattern Drill.

MISCELLANEOUS:
1—Pratt & Whitney #3 Cut-Off Machine, 3¾" hole thru' spdle.
1—Goss & DeLeeuw 6" 5-Spdle Chuck'g Machine—M.D.
1—Napier Model B 10 x 10 Metal Band Saw.
1—Garvin 2X Tapper.

MISCELLANEOUS (Cont.):
2—Bilton #2½ Gear Cutters.
3—Bilton #1 Gear Cutters.
1—Nilson #4 Four Slide Wire Former.
3—Pratt & Whitney #14 2-Spdle Profilers—M.D.
2—Leland-Gifford 2-Spdle Profilers.
1—Newark 3 x 36" Gear Cutter Incr. to take larger diam.
1—W. W. Sly No. 00 Sand Blast Outfit, 32" diam. x 48" sand tank. Equipped with Norbide Nozzle.
1—Pratt & Whitney #3 Die Sinker.
1—Niles 12" Vertical Slotter.
1—Pratt & Whitney 2-Spdle Gun Barrel Reaming Machine.
1—Pratt & Whitney 4" 2-Spdle Centering Machine.
1—Cleveland 2" Model B Double Slide 18" Feed Automatic Screw Machine.

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94 GOLD STREET WORCESTER, MASS.

GUARANTEED USED MACHINE TOOLS

DRILLS

4 spdl. Sigourney (4)

4 spdl. Henry & Wright (19)

MILLERS

26" x 36" x 10' Ingersoll

26" x 25" x 12' Ingersoll

GEAR CUTTERS

No. 60BM Gould & Eberhardt Bevel Gear Rougher (2)

GRINDERS

(See page 283, Hill-Clarke Cylindrical grinders)

No. 40 Bryant Plunge Cut, Wide Wheel, Oscillating

No. 10 Lees-Bradner Spur Gear Grinder 1½" dia. New Yankee Drill Grinder

TURRET LATHES

18" Libby

HILL-CLARKE MACHINERY CO.
649 Washington Boulevard
Chicago, Illinois

OTT MACHINERY SPECIALS

AUTOMATICS, Gridley, 2¼, 3¼, 4¼ & 5½" S.S.
AUTOMATICS, Gridley, 1¼ & 2⅝" Model F.
AUTOMATICS, Cleveland, 1¼, 2 & 2½" Model B
AUTOMATICS, Cleveland, ⅞ & 2⅝" Model M
AUTOMATICS, Cone, 2½" 4 spdle. M.D.
AUTOMATICS, #22, 23 & 24 New Britain
AUTOMATICS, Potter & Johnston #5A & 6A
GRINDERS, Norton. 14x36" Plain, M.D.
GRINDERS, Heald Rotary Surface, 8" M.D.
GRINDERS, Landis, 6x18" Hydraulic, M.D.
LATHE, Putnam, 60"x17' with 12" Riser Blocks, total swing 85" M.D.
LATHE, 3x36" J.&L. Dble. Spdle.
LATHE, Sundstrand, 8" Stub, M.D.
MILLING MACHINES, Craftsman #1 & 2
PLANER, Gray, 42"x42"x12', 3 Heads, M.D.
PLANERS, Bedford & Patch, 36" x 13' Open Side with 1 Rail & 1 Side Head
PRESSES, Toledo, #34 Solid Back, S.G.
PRESSES, Toledo, #2 to 5 Open Back Inclinable
PRESSES, Ferracute, P2, 3 & 4, Solid Back

OTT MACHINERY SALES, INC.
542 Second Ave. Detroit, Mich.

LATHES

18" x 6' American Grd. Hd. 8 speed M.D. turret on shear Q.C.
24" x 18' New Haven, Semi Q.C. Cone drive.
40" x 20' McCabe Lathe, Cone Drive, Trip. Grd.
56" x 18' Putnam Turning Lathe, Belt feed.

GRINDERS

#14-20" Besley Disc Grinder.
Fitchburg Spline Shaft Grinder.
#55 Heald Cylinder.

MILLERS

#1 P & W Hand Miller.

GEAR MACHINERY

18" Gleason Bevel Gear Generators.
6" Bilgram Bevel Gear Generator.
18H Gould & Eberhardt Gear Hobber.
#1 Adams Gear Hobber.
#4—36" B & S Automatic Gear Cutter.
Lees Bradner Gear Grinder.
#3-26" B & S Gear Cutter.

BORING MILLS

42" Colburn, Turret head and plainhead.

PLANERS

24" x 6' Cincinnati Planer.

MISCELLANEOUS

14" Niles Slotter.
1500# Bell Steam Hammer.

CINCINNATI MACHINERY & SUPPLY CO.
217 East Second Street Cincinnati, Ohio

LATHES

14"x6' Lodge & Shipley
16"x6' Lodge & Shipley
17"x10' LeBlond
18"x14' Whitcomb Blandell
No. 324 Adriance Spinning

MILLING MACHINES

2" Pratt & Whitney spline (duplex) (Double)
No. 1 Foote-Burt Surface Broach
New No. 3 Wigglesworth
No. 2 Knight Vertical

TURRET LATHE

Goss & De Leeuw Chucking, 6"x6½"

DRILLS

No. B16 Natco M.D.
4 Spindle Taylor & Fenn M.D.

GEAR MACHINERY

6 Cimatool chamfering M.D.
Lees Bradner Gear Grinders (2)
9" Pratt Whitney Gear Grinder
11" Gleason Bevel Gear Generator

MISCELLANEOUS

8" Bullard Multimatic M.D.
No. 1 Foote-Burt Duplex Surface Broach
24x24x8 Whitcomb Planer
36"x36"x8' Woodward & Powell Planer Rev. M.D.
No. 303 Bliss St. Side Gd. M.D.

WIGGLESWORTH MACHINERY CO.
203 Bent St., Cambridge, Mass.

IMMEDIATE DELIVERY

10' NILES VERT. BORING MILL

Canal Machinery Co.
176 Lafayette St. NYC

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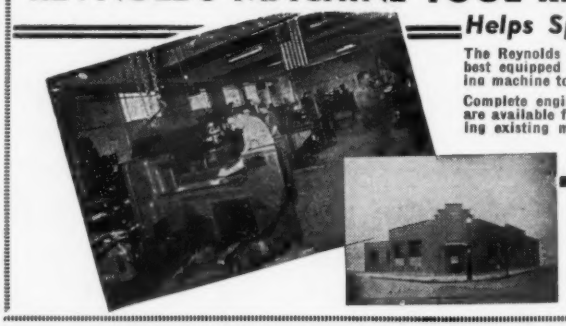

Helps Speed War Production

The Reynolds plant is one of the most modern and best equipped plants in Rhode Island for rebuilding machine tools.

Complete engineering and manufacturing facilities are available for modernizing, motorizing and placing existing machine tools in condition for maximum production demands and highest accuracy.

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PROVIDENCE, R. I.
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MISCELLANEOUS MACHINES

30x30x12' Gray Spur Grd. Planer, m.d.
12x18" Cincl. Plunge Cut Grinder, m.d. with 9" face wheel, and oscil. att.
3' Carlton Sensi. Radial, with tapping att.
6' Niles Plain Radial Drill
4-spindle Henry & Wright High Speed Drill
Gisholt Tool Grinder, arr. for m.d.
10"x10" Napier Metal Band Saw
¾" Shuster Wire Straightener & Cut-off Machine
½" Shuster Wire Straightened & Cut-off Machine

STRONG, CARLISLE & HAMMOND COMPANY
1392 West 3d St. Cleveland, Ohio
2832 E. Grand Blvd. Detroit, Mich.

Cincinnati No. 5 Plain Miller S.P.D.

GRINDERS

Landis 12x36", 16x5, self-Cont., M.D.
Modern 10x24", 14x42", M.D., Norton 16x50"
Pratt & Whitney 14", B.B. M.D.
Norton 50"x28' Roll, M.D.
Heald No. 55, 60.

LARGE LATHES

36"x17' Pond, Grd. Head, M.D.
38"x32' Cleveland Engine, Grd. Head, M.D.
48"x12' Harrington Gap. sld. bed.
26"x13' Boye & Emmes
26"x14' Rahn-Larmon raising blocks to 34"
24"x14' Rahn-Larmon
40"x20' McCabe

AARON MACHINERY CO.
45 CROSBY STREET NEW YORK, N.Y.

YOU CAN NOW HAVE YOUR NORTON GRINDERS MODERNIZED AND MOTORIZED

WE ARE IN A POSITION TO TAKE ON A LIMITED NUMBER OF THESE AT THE PRESENT TIME

SEE GRINDER AD ON PAGE 283

HILL-CLARKE MACHINERY CO., CHICAGO, ILL.

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LAPPERS

Immediate Delivery

1-F NORTON LAPPERS

Dia. of lap 20"

Max. distance between laps 4"

These machines are well adapted for lapping piston rings, gauges, shims and other flat work.

PRICE $1250

Condition Excellent

LOUIS E. EMERMAN & CO.

Machinery

871 W. 120th St., Chicago, Ill.

AUTO. SCREW MACHINES

1⅜", 1¾", 2¼" Gridley 4 spindle

1", 2¼" Nat.-Acme 4 spindle

3¼", 4¼" Gridley sgle. spindle

CANAL MACHINERY COMPANY
176 LAFAYETTE STREET, NEW YORK, N.Y.

EASTERN OFFERS FROM STOCK

ENGINE LATHES

18"x10' Lodge & Barker
22"x16' centers (22' bed) American 100 H.P. Input Super Lathe, variable speed motor drive, with 100 H.P. D.C. motor and 4 additional D.C. motors, p.r.t., chip breaker, chip conveyor
22"x18' Niles
24-48"x14' McCabe 2 in 1, m.d.
26"x16' Betts-Bridgeford, taper
27"x14' Lodge & Shipley
27"x16' LeBlond, taper
30"x14' Lodge & Shipley
36"x16' Springfield

MANUFACTURING LATHES

3½"x36" LoSwing
3x30" LoSwing
9x12" Sundstrand Mfg.
14"x6' Champion Mfg.
15"x6' Automatic Threading Lathe
42x96" Niles-Bement-Pond Car Wheel Lathe, m.d., new
42x96" Niles-Bement-Pond Car Wheel Lathe, m.d., used
Niles-Bement-Pond Axle Lathe, belt
64"x11' New Haven Pulley Turning Lathe
No. 2 Niles-Bement-Pond Axle Lathe, m.d.
Niles-Bement-Pond Quartering Machine, m.d., new

MILLING MACHINES

No. 2 Cincinnati Universal, cone
No. 1½ Lodge & Davis Universal, cone
Hendey-Lincoln Type Mfg. Miller
Burr Mfg., m.d.
4½x12" Pratt & Whitney Thread
6x14" Pratt & Whitney Thread
18" Cincinnati Mfg.
36"x36"x14' Bement Slab, m.d.

PIPE MACHINES

1¼"—2 spindle Landis Pipe & Nipple
2" Bignall & Keeler
4" Curtis & Curtis
4" Eaton, Cole & Burnham
2" Jarecki
4" Merrell
6" Columbus
8" Bignall & Keeler
15" Cox

AUTOMATICS

4 spindle ¾" Cleveland Model M, m.d.
No. 6D Potter & Johnston Automatic for brake drum work
No. 22, 23, 33 New Britain Automatic

BOLT THREADING MACHINES

9/16" Landis 2 spindle, m.d.
¾" Style R Economy Auto. Threading
2 spindle 1" Acme Class A
3 spindle 1" Acme
1¼" Acme, belt
American Bolt Heading Machine, 1⅛" cap.
No. 11S Rickert-Shafer Auto. Threading, m.d.

BORING MILL—HORIZONTAL

Sargent Floor Type, 2¾" bar, 13' travel of bar
4" double spindle Barrett, m.d.
8" bar Barrett, with facing attach.

VERTICAL BORING MILLS

42" Bullard New Era, m.d., side head
30" Colburn, 1 turret head
42" Niles-Bement-Pond Car Wheel Borer, facing attach.
48" Niles-Bement-Pond Car Wheel Borer

BROACHING MACHINES

Cincinnati Rotary Mill Broach, m.d., new
No. 2 LaPointe of Hudson, belt
No. 2 LaPointe, belt
No. 3 J. N. LaPointe Double, belt

BALL BEARING DRILLS

1 spindle Allen
1 spindle Automatic
No. ⅛ Avey
No. 2 Avey
No. 3 Avey
1 spindle Henry & Wright
2 spindle Sigourney
1 spindle Henry & Wright Class L
3 spindle Barr
3 spindle Henry & Wright
4 spindle 13" Super Speed Fosdick
4 spindle Henry & Wright Class B
4 spindle Kokomo
4 spindle No. 2 Fosdick, power feed
6 spindle Henry & Wright
7 spindle Bar

Let us quote on your machine tool requirements.

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CINCINNATI, OHIO

MOREY *DEPENDABLE* USED MACHINES

La POINTE No. 2 Two Spindle Broach
G & E 48" Gear Cutter
G & E 36B Spur & Bevel
GLEASON 10" Spiral Bevel Gear Gen.
GLEASON 6"-18" Bevel Gear Gen.
HEALD No. 70A Duplex Internal Grinder
HEALD No. 60 Internal Grinder
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330 W. 42nd St. — New York

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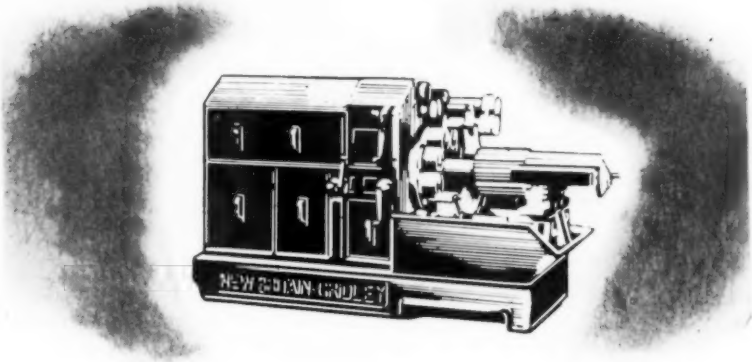

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March 18, 1943

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A "NATURAL" FOR NEWCOMERS

to Metal-Working..

★

Demands for reprints of this special section on employee training totaled almost 3,000 the first week

★

"The Tools of Our Trade", 16-page special section on elementary shop practice, appeared in the Feb. 18th issue of *American Machinist.* Orders for reprints immediately began pouring in at a rate that quickly exhausted our initial supply of extra copies. Clearly, production executives are finding this exactly the kind of information needed by new workers in Metal-Working plants. It removes the chief obstacle to the novice's progress . . . the simple fact that he doesn't know the names of things.

An additional quantity of "The Tools of Our Trade" is being printed, and we will continue to fill requests as long as they come in. If you have an instruction problem, this and others in the series which are to follow will put at your finger tips basic data which otherwise might take you months to prepare. Use the coupon below if you can use "The Tools of Our Trade".

AMERICAN MACHINIST
330 W. 42 St., New York, N. Y.

Please send me —— copies of "The Tools of Our Trade"

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Firm .....

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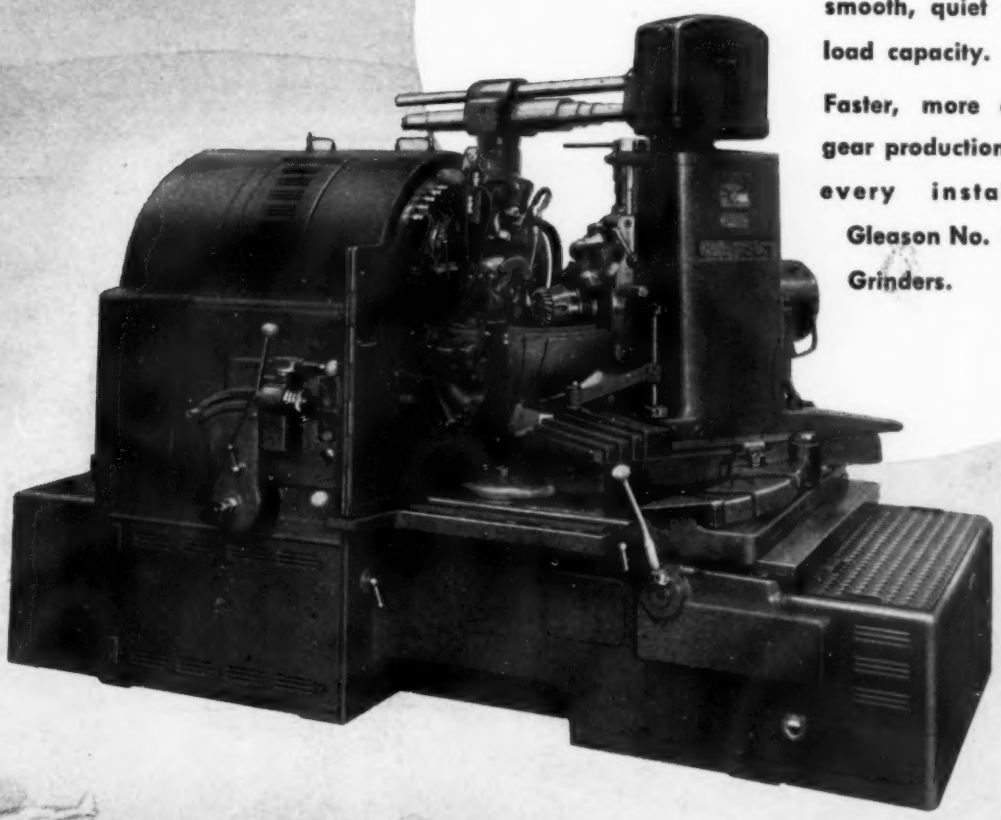
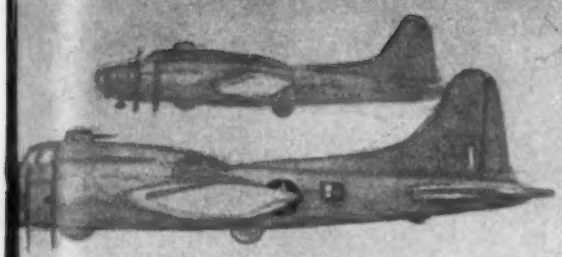
AVAILABLE AT
10 *CENTS EACH*
IN QUANTITIES
TO COVER COST
OF PRINTING

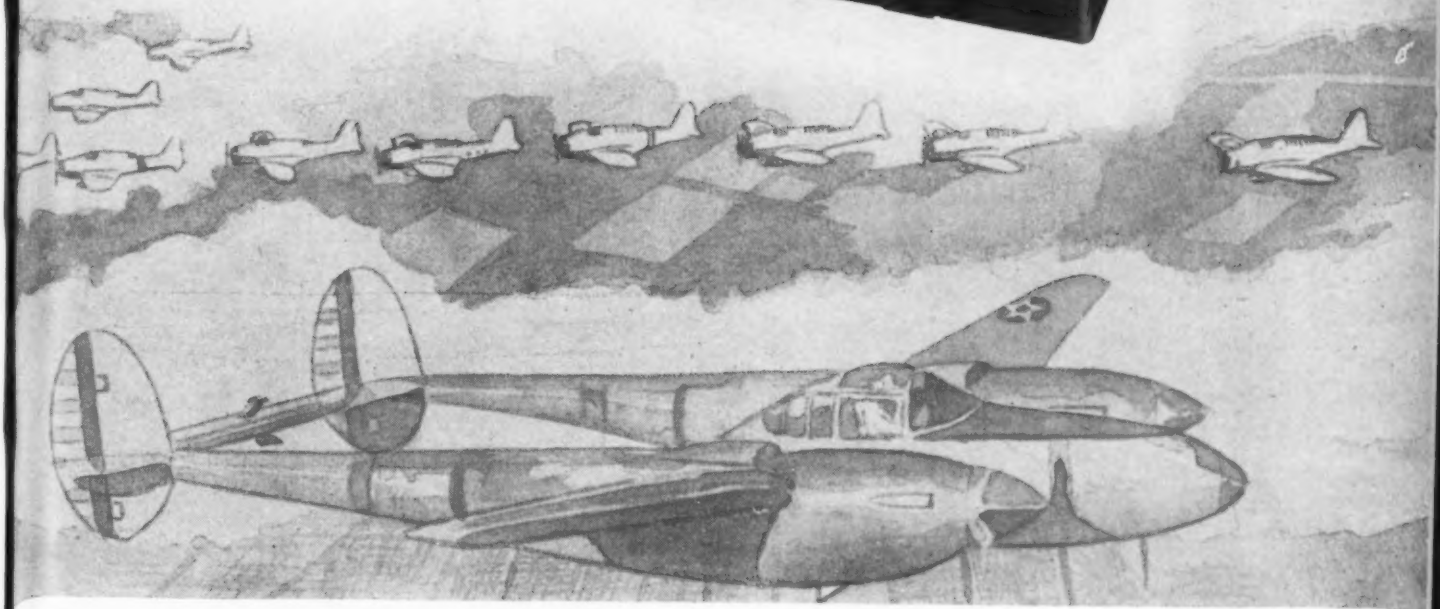
No. 17
HYPOID GRINDER

This new Gleason meets the high-speed precision requirements of aircraft manufacturers who are grinding the teeth of spiral bevel, zerol bevel, and hypoid gears. Distortion-free, absolutely uniform teeth are produced to give smooth, quiet action and high load capacity.

Faster, more accurate, bevel gear production has followed every installation of Gleason No. 17 Hypoid Grinders.







GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER, N. Y., U. S. A.

DON'T GU

ask

CINCINNATI No. 0-8 Plain Automatic Milling Machine equipped with Automatic Rise and Fall Spindle Carrier profile milling top face, and burring the inside edge of the oval web opening of "Rotating Hook." Close-up shown on opposite page.

Navy E awarded March 6, 1942. Renewal Star awarded September 6, 1942, along with Army-Navy E.

THE CINCINNATI

MILLING MACHINES

ESS

CINCINNATI

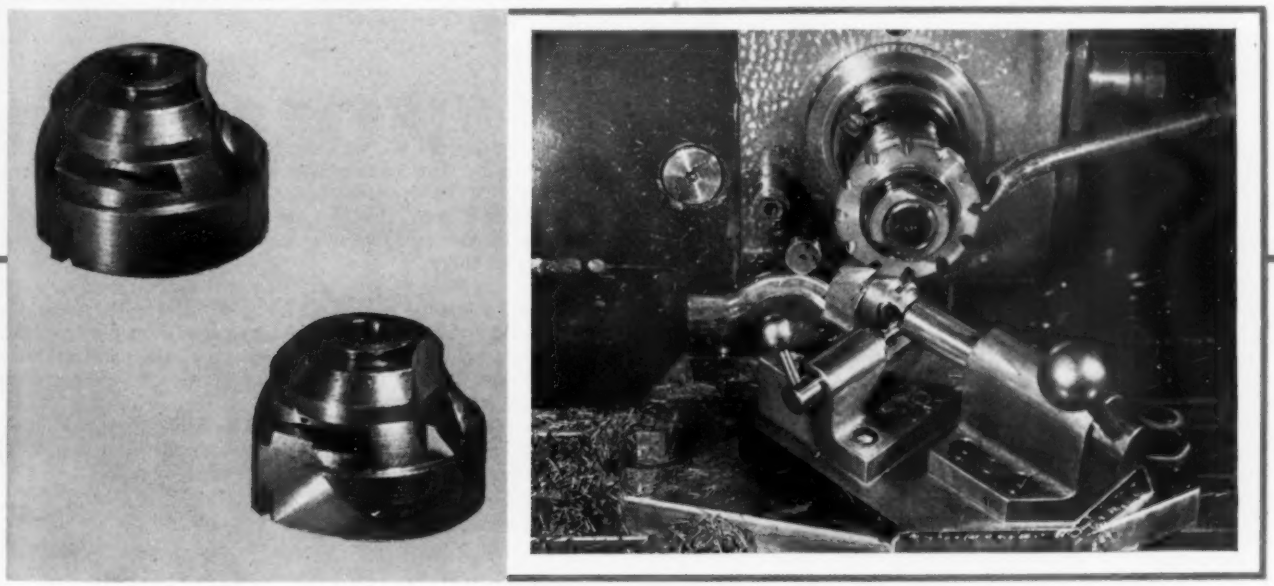
k Milling Headquarters

The slogan "There's no substitute for knowing how," is especially true in times like these when complex milling problems are arising constantly. Illustrated on these two pages is an example of how CINCINNATI Engineers licked an exceedingly difficult problem.

If you have a problem that involves any milling operation, feel free to consult CINCINNATI Engineers here at Milling Headquarters. This group of Field and Factory Engineers is capable of coping with any milling situation, for behind every CINCINNATI Milling Machine are fifty-nine years of engineering triumphs . . . into every machine has gone the combined skill of many highly trained technicians.

Today in every corner of the globe CINCINNATI Milling Machines are giving unfailing performance — doing their part in winning the war. And they will continue to give the same dependable service many years after the war is over, and do their part in producing the things it's going to take to make the world a better place in which to live.

Sweet's Catalog File for Mechanical Industries contains a brief description of all CINCINNATI Milling Machines. We shall be glad to send you specification catalogs giving more detailed information on any milling machines in which you are interested.



Close-up of the work pieces "rotating hooks." The cam roller attachment (to the left of milling cutter) combined with the Automatic Rise and Fall Spindle Carrier, makes it possible to accurately reproduce the contour of the template on the work piece. All the operator does is load the work fixture and flip starting lever. The machine then takes over and completes the entire operating cycle automatically.

TMILLING MACHINE CO. CINCINNATI, OHIO, U. S. A.

BROACHING MACHINES • GRINDING MACHINES • LAPPING MACHINES

SURE and there are those who'd punch the nose of the man who wouldn't lift one to Billy, tonight — in a dignified fight, of course.

For we've turned back the timeclock to March 7, 1903, when Smiling Billy had a hand in the destiny of a great American industry. . . . He fought a battle with a giant turbine, while history hung in the balance.

He was a shop foreman in one of the early plants of General Electric. His company had pioneered research in turbine engineering, and had staked its reputation on the plans of the first commercial steam turbine generator. It was to be a gigantic machine, and the Commonwealth Edison Company of Chicago had courageously designed their entire new Fiske Street generating station around the plans for this unborn behemoth. . . . The date they had set for the official test was March 7, 1903.

By February, the turbine was still months from completion. A meeting of foremen was called. "Who among our general foremen is 100 per cent qualified to complete the building of the turbine *on time*?" they were asked. A single name had the vote of every man there.

The story of Billy's battle with the turbine is a minor classic of one man's knowledge of machinery, tools and men. Around him lay thousands of unfinished parts. Ahead of him lay the task of assembling a machine as big as a two-story house and as delicate as a lady's watch — that could shatter itself to pieces from a microscopic error in tolerance.

He won. On March 7, less than three weeks from taking over, Smiling Billy waved a grimy hand, and the first big turbine generator began to whine a brand new song of power.

They're setting 'em up for Smiling Billy, tonight!

HISTORY is made that way. It's being made that way today, in the biggest battle of all time, because many of the great men of industry are men with grease on their hands.

Today, Jones & Lamson machine tool engineers are working with those men on hundreds of America's most important assembly line jobs — and have been from the very beginning of every great industry in America. They were there in the days of Smiling Billy, and they'll be there tomorrow when you call!

JONES & LAMSON
MACHINE COMPANY

Manufacturers of • **Universal Turret Lathes** • **Fay Automatic Lathes** **Automatic Thread Grinders** • **Optical Comparators** • **Automatic Opening Die Heads**

Springfield, ***Vermont,*** **U. S. A.**

PROFIT-PRODUCING
MACHINE TOOLS

Hidden

Official U. S. Navy Photograph

WAR PRODUCTION BULLETIN

FELLOWS GEAR SHAPER ACCURACY

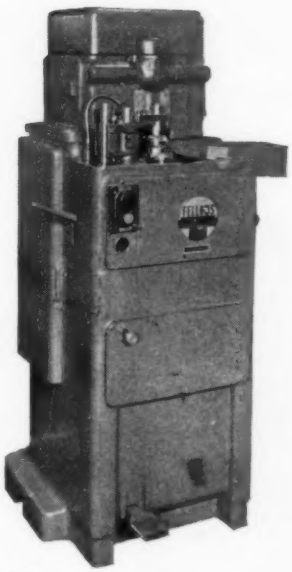
The cutting of enormous quantities of tiny gears, pinions, quadrants and other delicate instrument parts is another indirect "Fellows" contribution to the prosecution of our war effort.

FELLOWS

MACHINES AND TOOLS FOR GEAR PRODUCTI

deaway **PRECISION GEARS ARE**

NONE THE LESS Important



Fellows
Fine-Pitch Gear Shaper

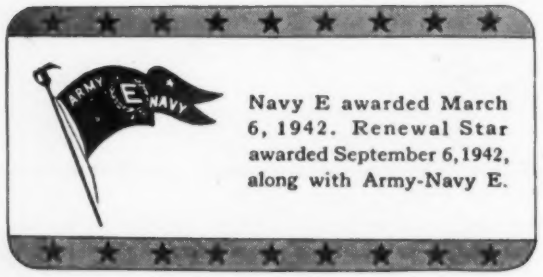
Hidden behind the multiplicity of dials of an airplane instrument panel, are mechanisms in which gears, pinions, quadrants and other Fellows Gear Shaper cut parts perform an important function. Initial design must provide for unfailing accuracy within an extremely wide range of operating temperature—tropic heat and sub-zero cold. Manufacturing tolerances have to be held within exceptionally close limits. Fellows Fine-Pitch Gear Shapers and, for many gear-parts, Fellows Gear Burnishing Machines, have made it possible for instrument makers to standardize on high precision on a mass-production basis. Here again, the Fellows Method is contributing towards the success of our war effort. For literature on Fine-Pitch Gear Shapers, write: The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Bldg., Detroit, Michigan, or 640 West Town Office Bldg., Chicago, Illinois.

Method

. . . . FROM BLANK TO FINISHED GEAR

DON'T GUESS
ask Grinding Headquarters

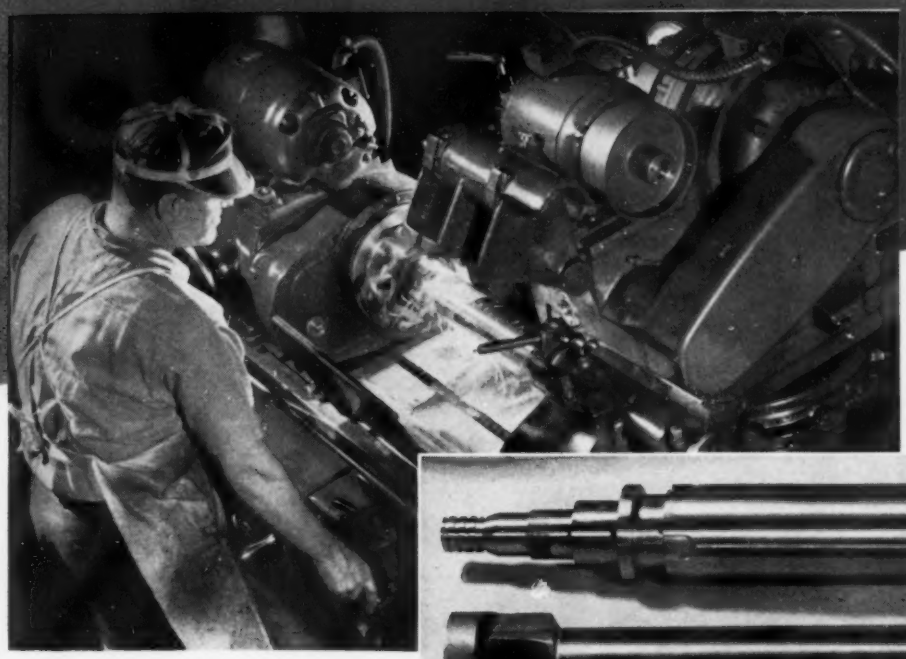
CINCINNATI Hydraulic Universal Grinding Machines are available in 12", 14", 16" and 18" swings; between center distances up to 72".

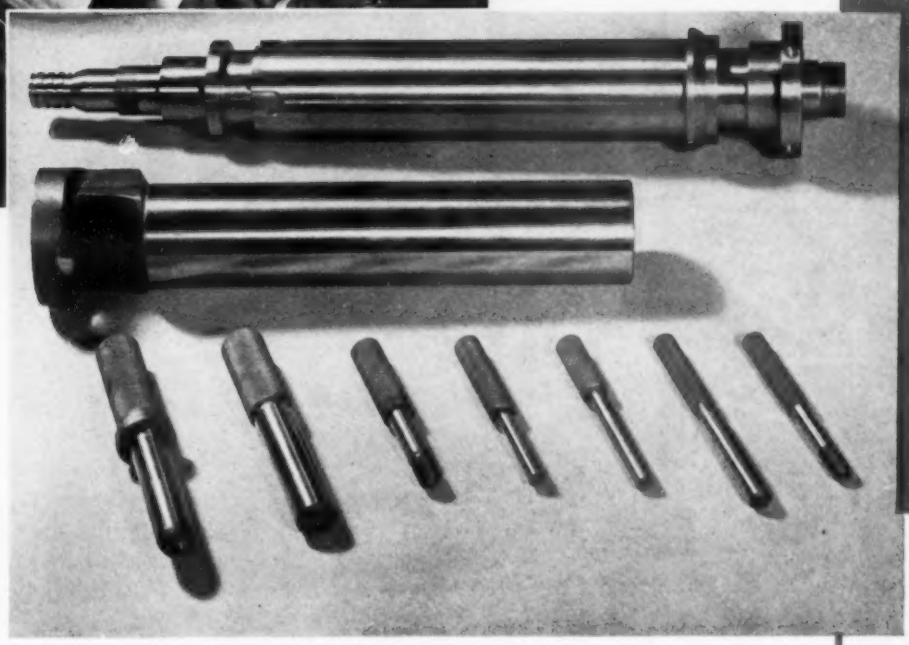


Navy E awarded March 6, 1942. Renewal Star awarded September 6, 1942, along with Army-Navy E.

CINCINNATI

CENTER TYPE GRINDING MACHINES





Above: CINCINNATI 12" x 72" Hydraulic Universal Grinding Machine finish grinding spindles. Tolerance + .000"/—.001" on O. D.

Right: Machine spindles, shafts and bushings, fixture parts and plug gauges ground on CINCINNATI Hydraulic Universal Grinding Machines. Many of these parts are held to + .0001"/—.0002" tolerances.

The services of **CINCINNATI** Field and Factory Engineers are available to help you get more from your present equipment, and to suggest the correct procedure for handling specific grinding operations using new **CINCINNATI** Grinding Machines.

By placing your problems before **CINCINNATI** Engineers you may eliminate many hours of needless, costly experiments. You may be sure, too, the recommendations offered by this staff of highly trained technical experts will answer correctly your most difficult grinding problem.

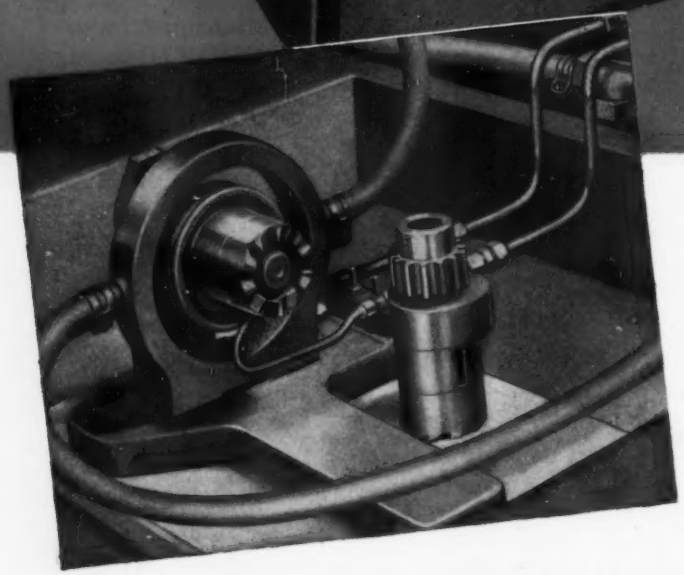
Look in Sweet's Catalog File for Mechanical Industries for brief description of CINCINNATI Grinding Machines, both Centerless and Centertype. Let us know in which machines you are interested, and we will send specification catalogs giving full details.

T GRINDERS INCORPORATED

INCINNATI, OHIO, U. S. A.

HINES NTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

Surface Harden Parts



To harden the various surfaces of the part shown, a horizontal work-holding fixture is used. The part has three separate hardening operations. The holding fixtures and heating coils for the other two hardening operations are quite similar in design.

In Seconds

with VAN NORMAN INDUCTION HEATING UNITS

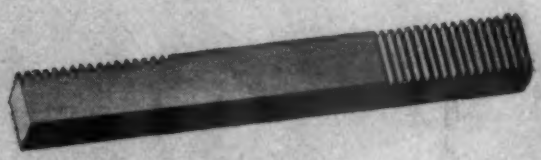
SELECTIVE HEATING SAVES TIME, PROVIDES UNIFORM HARDENING, INCREASES OUTPUT

Van Norman Induction Heating Units enable manufacturers to surface harden parts in seconds as compared to hours when other methods such as carburizing are used. This important time-saving feature increases production and reduces costs. Since induction heating localizes heat only the section to be hardened is heated instead of the entire work piece, as when other methods are used. This feature alone reduces heating time and costs. In addition, parts, such as the teeth of a gear, are heated to provide the exact hardness wanted and to a predesired depth with practically no change in the structure of the untreated portion of the part. Induction heating eliminates possible warping and distortion and leaves the work free from undesirable scale. And because the heating and quenching time is automatic, chance of human error is eliminated and part after part is turned out with *identical* characteristics. Illustrated at right are a few typical hardening applications. Write, on company letterhead, for the new descriptive bulletin.

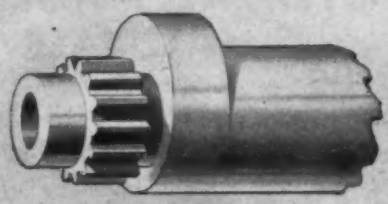
Van Norman Machine Tool Company

Springfield, Massachusetts

The teeth of each gear section of a cluster of gears can be surface hardened, in a few seconds, to the desired Rockwell hardness for greater wear resistance. In the illustration, each gear section is hardened separately.



Surface hardening rack teeth is a matter of seconds with induction heating. Teeth are simply held over a flat or "pancake" type heating coil for the prescribed number of seconds, followed by a cold water quench.



The part illustrated has three separate localized hardening operations. Gear teeth are hardened to 52-55 Rockwell C, the eccentric surface to 60-62 Rockwell C, and the clutch teeth are hardened to 56-58 Rockwell C.

Two surfaces for needle bearings are surface hardened to 62 Rockwell C on the shaft illustrated. Because heat is localized, the rest of the shaft is unaffected by the heating operation, and a straightening operation is eliminated.

OTHER APPLICATIONS

Brazing, soldering, annealing, forging, melting, and other applications requiring localized heat.

With the LANDIS *Chaser – Thread Quality is Assured by the Variable* RAKE ANGLE

RAKE ANGLE RANGE COVERS ALL MACHINABLE MATERIALS

The rake of the Landis chaser is variable, ranging from 5° negative to 35° positive.

This variable rake permits the use of the suitable cutting angle for each machinable material and assures the production of cleanly cut and correctly formed threads.

12 Features of the LANDIS TANGENTIAL CHASER

1–Permanent throat permits close to shoulder threading throughout life of chasers
2–Rake angle range covers all machinable materials
3–Free cutting condition permits maximum cutting speeds
4–Simple grinding operation renews entire cutting edge and leading feature
5–Line contact with work lessens friction and minimizes thread distortion
6–Leading feature insures thread of accurate lead
7–Lateral absorption of cutting strain reduces vibration and chaser breakage
8–Right and lefthand threading feature reduces chaser equipment
9–Standard chasers thread all diameters with proper chaser holders
10–Interchangeability of chasers lowers operating cost
11–Chaser length provides exceptionally long life and low tool cost
12–Permanent throat gives equal distribution of cut

LANDIS
MACHINE COMPANY
WAYNESBORO, PA., U.S.A.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

LANDIS REG. U.S. TRADE—MARK PAT. OFF.

THREAD TIPS

A Good Mechanic Knows and Cares For His Machine

In the Interest of Efficiency, Better Workmanship and Higher Production

ACCUMULATION OF FINE CHIPS UNDER CHASER CLAMPING AND SEATING SURFACES CAUSES CHASER BREAKAGE

Unless all seating surfaces of both the Chasers and the Chaser Clamps are cleaned thoroughly when changing chasers, fine chips will accumulate on these surfaces which will throw the chasers out of alignment causing "side shaved" threads and eventual chipping out of the chaser at the dove tail.

Clamping force has no support when chaser is not properly seated.
This causes dove tail part of chaser to chip out at point "A."

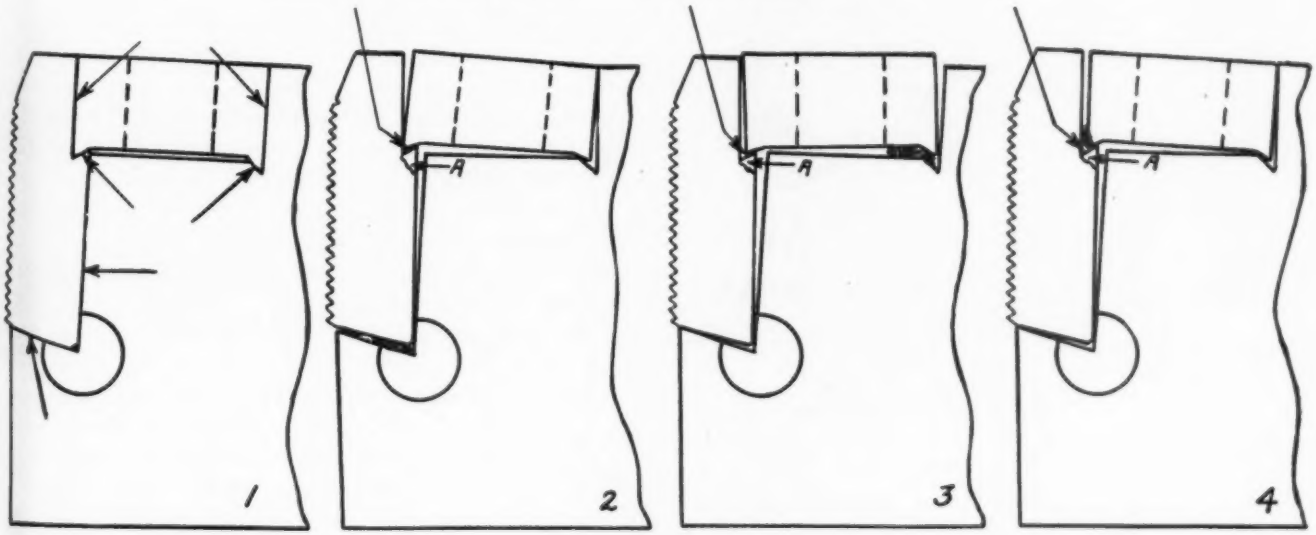


Fig. 1—Arrows point to where proper seating takes place.
Fig. 2—Showing improper seating of chaser caused by chips on chaser seat.
Fig. 3—Showing improper seating of chaser caused by chips under chaser clamp.
Fig. 4—Showing improper seating of chaser caused by burr on chaser clamp.

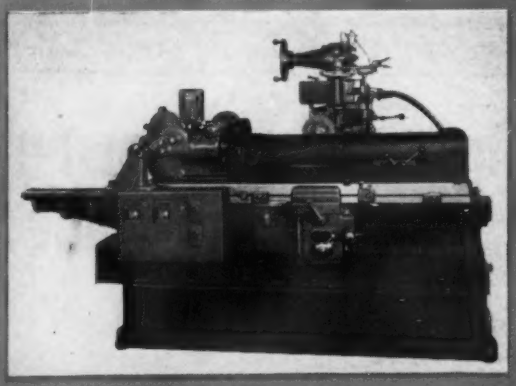
Excessive chaser breakage can be prevented by cleaning all seating surfaces thoroughly and by removing with a hone any high spots on the chaser clamps, which may be caused by clamping down on chips or dirt.

Be Threadwise—Employ LANDIS Long Life Tangential Chasers

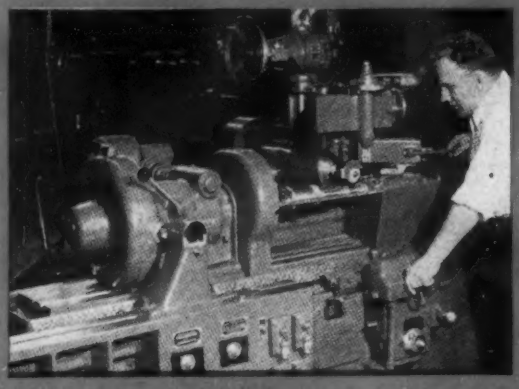
LANDIS MACHINE COMPANY
Waynesboro, Penna., U. S. A.

Get all 3 - DIMENSIONAL ACCURACY PERFECTION OF FINISH PRODUCTION SPEED

with FITCHBURG *Automatic Closed Cycle Grinding . .*



FITCHBURG SPLINE GRINDER



GRINDING SPLINES ON WRIGHT AIRPLANE CRANKSHAFTS

EXAMPLES OF WORK GROUND ON FITCHBURG SPLINE GRINDER

The Fitchburg formed wheel grinding method, with automatic closed cycle, produces a wide variety of splines for automotive, airplane and marine industry with fine finish, accuracy and high speed. This results in smoother product performance.

Here are some of the outstanding features of the Fitchburg Spline Grinder:—

These machines are designed so that new operators can be trained quickly to operate them — an important factor in these times.

Wheelhead column may be arranged to swivel to a maximum of 20 degrees for either right-hand or left-hand helical lead angle when helical attachments are furnished.

Elevating mechanism is mounted on top of the column for the convenience of the operator.

The headstock may be furnished for either straight, right-hand, or left-hand helical splines.

The index plate is mounted at the left-hand end of the headstock so that it may be removed easily for changing plates. There is a standard 16 key plate which will take care of 2, 3, 4, 6, 8 and 12 spline shafts by inserts in the index notches. Separate index plates are necessary for other spline divisions.

Many leading industrial plants in the United States are using Fitchburg grinding equipment to speed production and save man hours. Let Fitchburg engineers show you how to speed production by this modern grinding method.

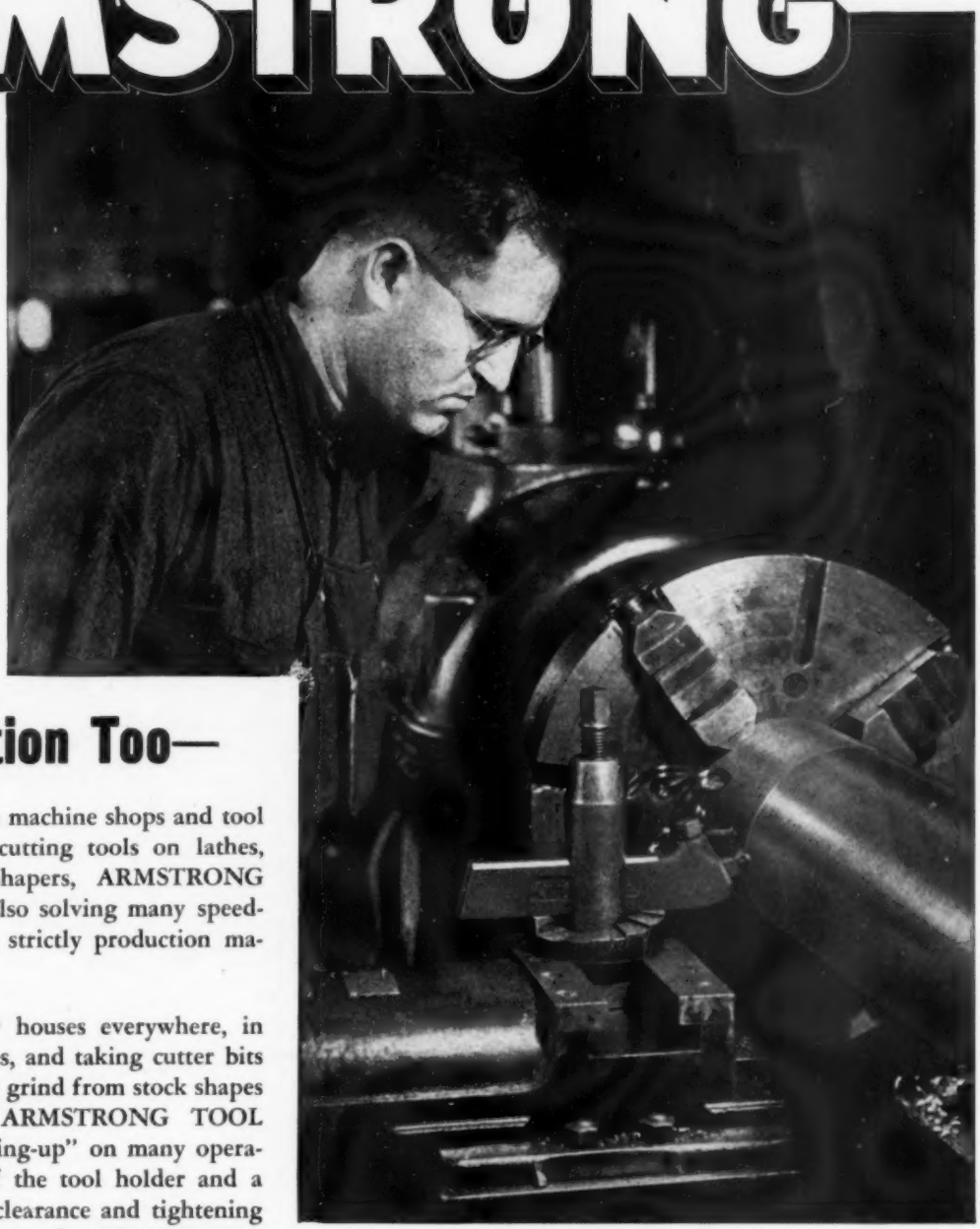
Write today for this catalog showing wide range of successful operations.

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U. S. A.

Manufacturers of — Bo-gage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

ARMSTRONG



For Production Too—

Used in over 96% of the machine shops and tool rooms as the standard cutting tools on lathes, planers, slotters and shapers, ARMSTRONG TOOL HOLDERS are also solving many speed-up tooling problems on strictly production machine tools.

Stocked by Mill Supply houses everywhere, in over 100 sizes and shapes, and taking cutter bits any mechanic can quickly grind from stock shapes of high speed steel, ARMSTRONG TOOL HOLDERS reduce "tooling-up" on many operations to the selection of the tool holder and a cutter-bit, adjusting for clearance and tightening of a set screw. Not only do ARMSTRONG TOOL HOLDERS speed production by ending "tooling-up" delays, they also permit higher running speeds and heavier feeds—output limited only by the pulling power of the machine-tool.

If you are faced with a tooling problem, it will pay you to look first at the new ARMSTRONG C-39 Catalog that shows ARMSTRONG TOOL HOLDERS and ARMSTRONG TURRET LATHE and SCREW MACHINE TOOLS, all permanent multi-purpose tools that "Save All Forging, 70% Grinding and 90% High Speed Steel".

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

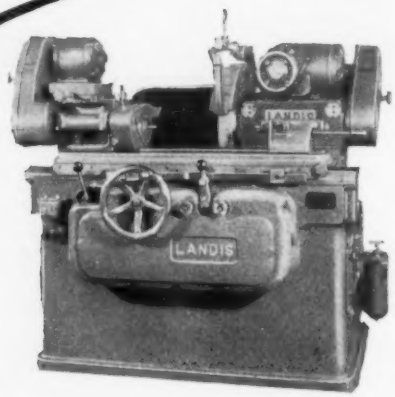
315 N. FRANCISCO AVE. CHICAGO, U.S.A.

Eastern Warehouse and Sales:
199 Lafayette St., New York

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

IT'S ALL
George Grindit Says
You might think a work center is a small piece of steel with a point on one end. Generally speaking that's true but the point of this remark is that no grinding machine operator can afford to neglect his work center points. Get the point!
PRECISION
LANDIS
GRINDERS

The book " BETTER GRINDING " procurable only from the Landis Tool Company, Waynesboro, Pennsylvania, pictures and describes the basic principles of all precision grinding. Thousands of both old and new operators, supervisors and apprentices are finding it helpful every day.



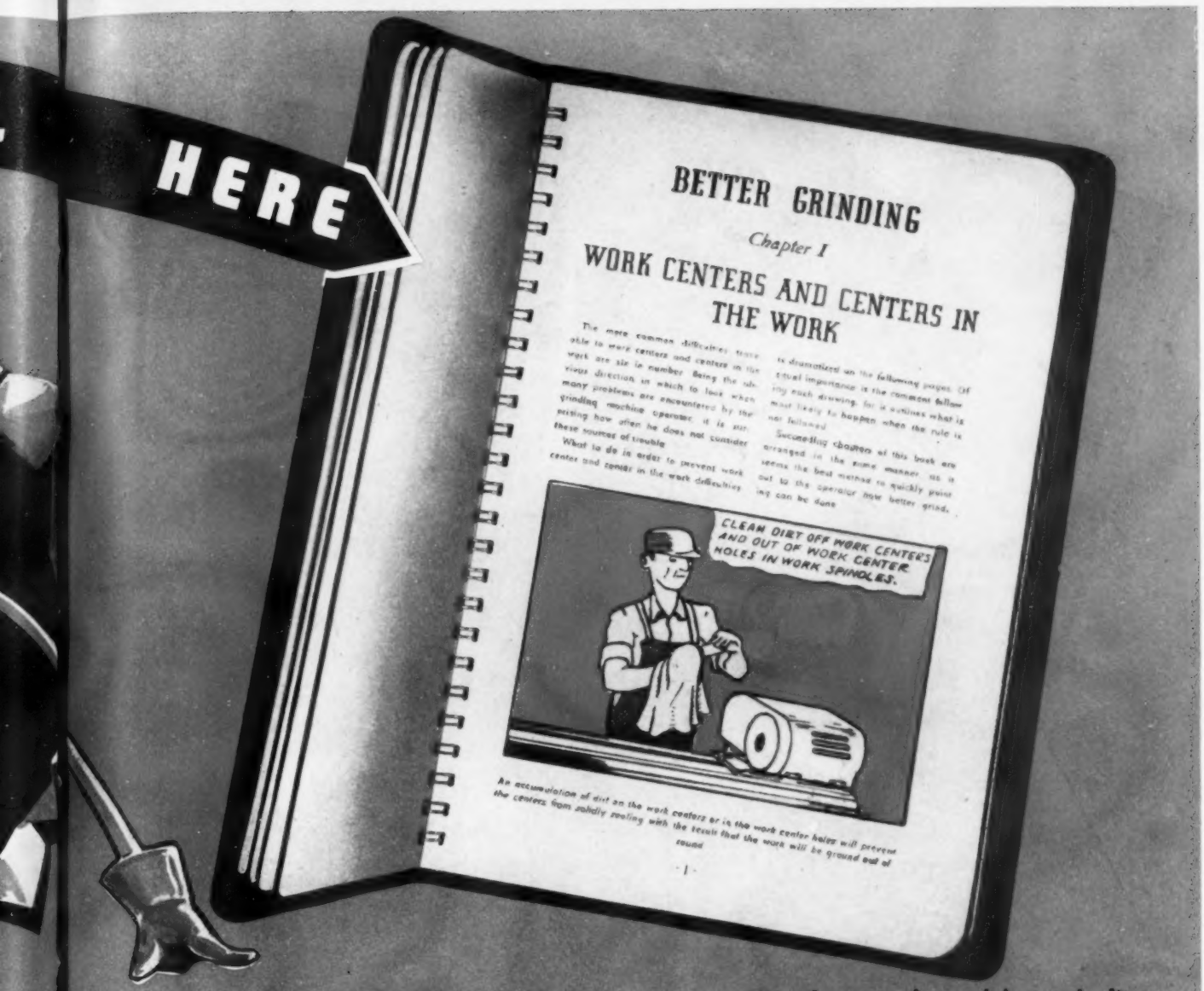
THE LANDIS 6" TYPE C PLAIN HYDRAULIC GRINDER

- Recommended for the production grinding of miscellaneous small parts beyond the capacity of the 4" Type H Plain machine.
- Used by many war industries for the grinding of such work as cartridge punches and assorted small airplane engine parts.
- Available in two lengths, namely, 18" and 30".

IF YOU HAVE A GRINDING PROBLEM

Let George do it

LANDIS TOOL COMPANY


HERE
BETTER GRINDING
Chapter I
WORK CENTERS AND CENTERS IN THE WORK
CLEAN DIRT OFF WORK CENTERS AND OUT OF WORK CENTER HOLES IN WORK SPINDLES.

You can't expect a green operator to master the art of precision grinding overnight. Such seemingly simple items as work centers and centers in the work and many others are certain to give him trouble. The first chapter of our easy-to-read book "BETTER GRINDING" will quickly straighten him out and give him just loads of other valuable information. Mail in the coupon below and I'll have a copy on its way in a flash.

THE CHAPTERS

Work Centers and Centers in the Work . . Work Drivers and Driving Dogs . . Work Rests . . The Diamond . . Wheel Dressing and Wheel Truing . . Mounting and Balancing the Wheel . . Grinding Wheel Coolant . . Lubrication . . Multiple V Belt Drives . . Wheel Spindles and Bearings . . Grinding Wheel Feed . . Grinding Wheel Width . . Speed of Work Carriage Traversal . . Work Speed . . Grinding Wheel Speed . . The Grinding Wheel . . Chatter . . Miscellaneous Bits.

Please Send Me a Free Copy of . . .

"BETTER GRINDING"

_____ NAME

_____ COMPANY

_____ ADDRESS

_____ NO. 1

Please Print Above and Send To

LANDIS TOOL CO.

WAYNESBORO, PENNSYLVANIA

WAYNESBORO, PENNSYLVANIA

FAR EASIER OPERATOR TRAINING

—experience of a hundred users of the DEVLIEG JIGMIL

Experience of more than a hundred users of the DeVlieg Jigmil has proved that operator training is far easier with this machine—because the Jigmil has built in features of quality that do not require a compromise with operator skill to produce accurate work in high production.

Every frequently used function of the machine is controlled in the master switch on the spindle head—at the operator's fingertips. These include:

Spindle start, stop and reverse.

Power vertical feed and rapid traverse movement.

Power horizontal feed and rapid traverse movement.

Power automatic table retraction and repositioning.

Power feed and rapid traverse to bar movement.

The operator never has to take his eyes off the work—never has to look at controls during operation. The machine is so convenient it gives greatly simplified response to the operator's skill.

An operator learns rapidly—frequently reaches full production of high quality in a week or two.

NEW TYPE MACHINE

Spacing accuracy of a jig borer . . . performance qualities of a milling machine . . . convenience and flexibility of a horizontal boring mill.

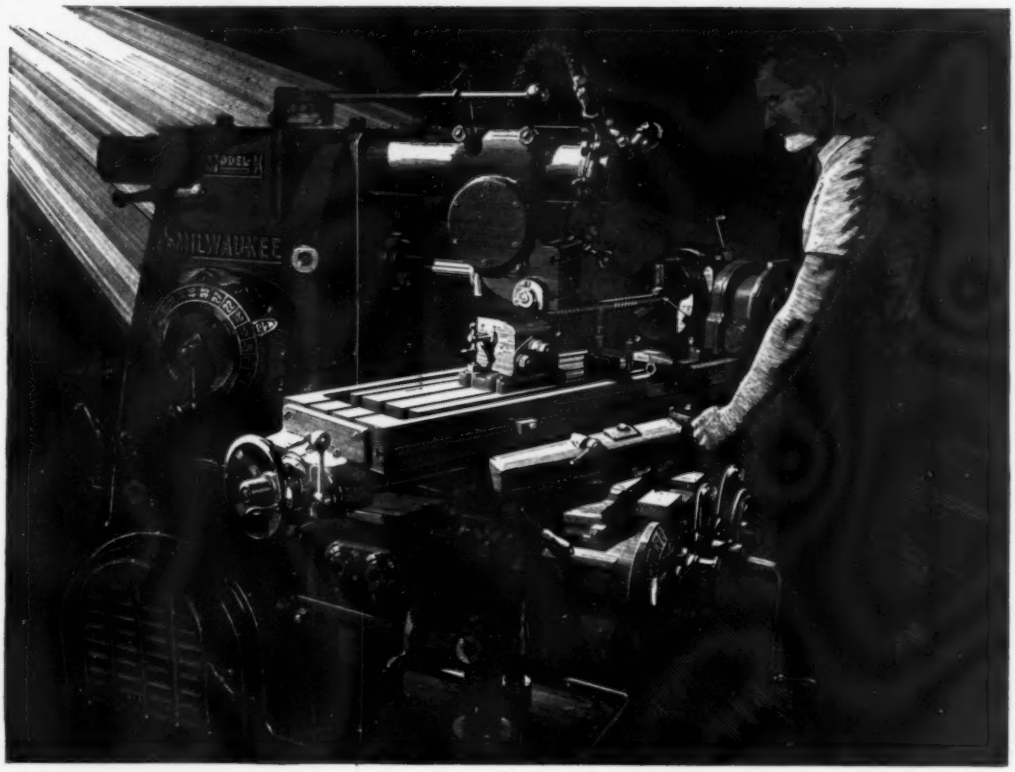
New speed of operation—many machines show 75% greater average daily productivity.

DE VLIEG MACHINE COMPANY

450 FAIR AVE. FERNDALE (DETROIT) MICHIGAN

Write for Circular

DEVLIEG MACHINE TOOLS



ATTACHMENT SUPPLANTS NEW MACHINE ... AVOIDS DELAY AND LOSS OF PRODUCTION

Milling threads on the barrel ends of AOG guns is no problem with a Thread Milling Machine—except that such a machine isn't always easy to get, especially when you need it "RUSH".

Holding up production, waiting for delivery of a new machine, isn't the answer either when "time's-a-wastin'."

Here's a case where a sub-contractor who had a thread milling problem knew where to go and what to do to get action!

A wire to the Emergency Production Service Department of Kearney & Trecker brought "results." The answer was a Thread Milling Attachment applied to a Milwaukee Milling Machine already available in the sub-contractor's shop. This attachment filled the bill nicely and production went right along without a hitch.

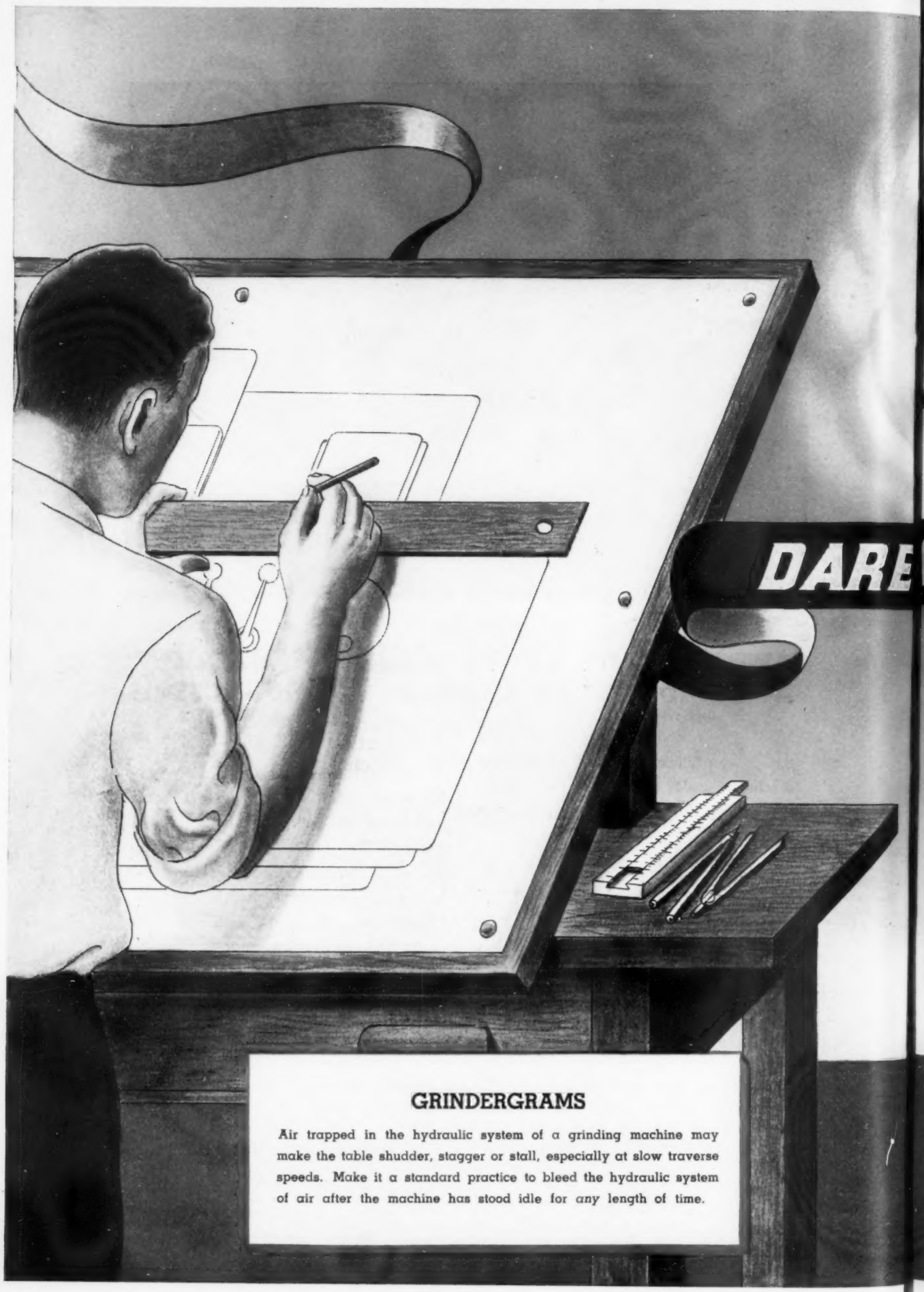
Buy Victory with at least 10% in War Bonds!

'43 FOR VICTORY

It's All A Matter of "Know How!" . . .
Because they specialize in milling problems . . . because they know how to get the most in performance...know when and how to best use attachments...the men in the Emergency Production Service Department can aid you in solving production and machine shortage problems. Make use of their services.

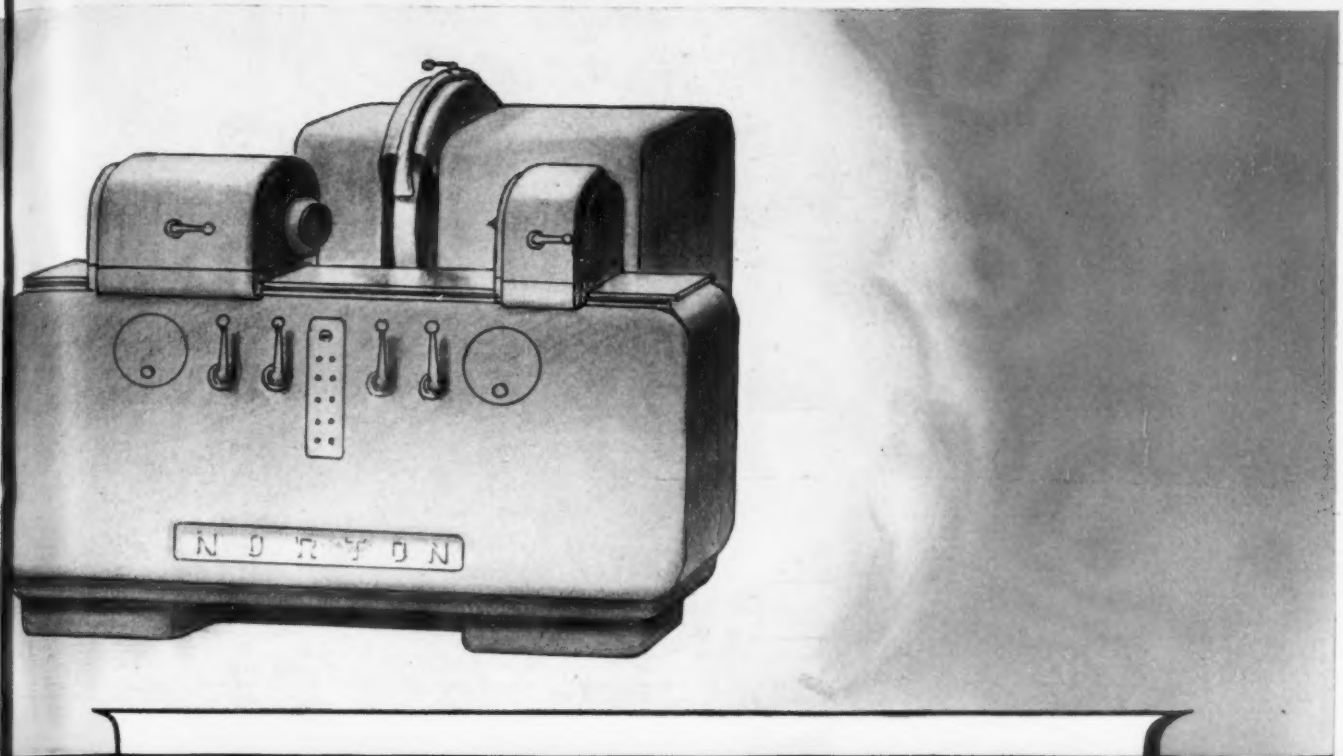
KEARNEY & TRECKER
CORPORATION
MILWAUKEE, WISCONSIN

Milwaukee MACHINE TOOLS



GRINDERGRAMS

Air trapped in the hydraulic system of a grinding machine may make the table shudder, stagger or stall, especially at slow traverse speeds. Make it a standard practice to bleed the hydraulic system of air after the machine has stood idle for *any* length of time.



RE WE EXPLORE THE FUTURE ?

What of the future? While our hands are busy with the tools of War, we deem it our national responsibility to consider the problems to follow the Peace.

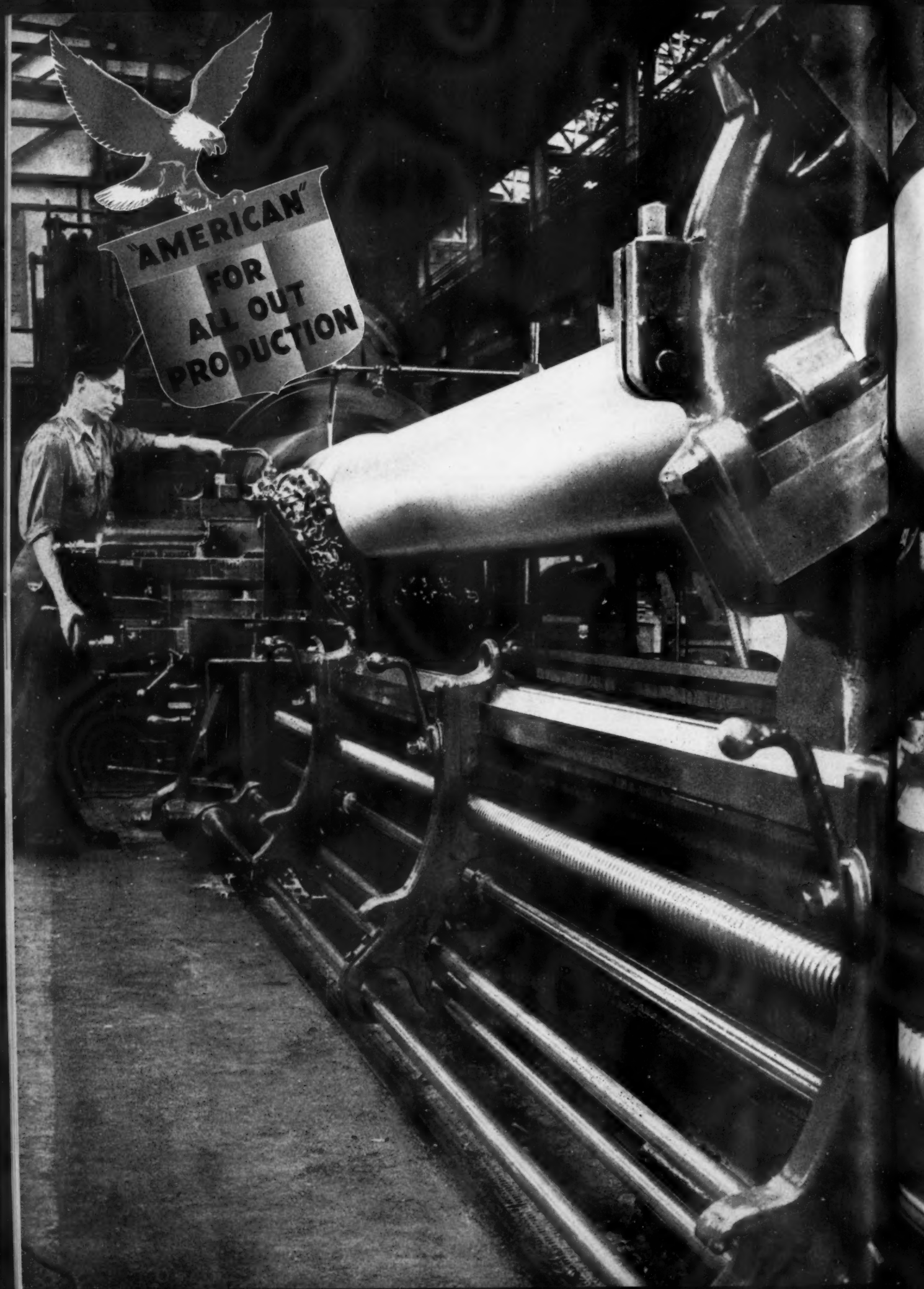
Norton Company has supplied hundreds, yes, thousands of grinding machines for home-front production lines. Others go to actual fighting fronts as vital servicing equipment for battleship, airplane and tank alike.

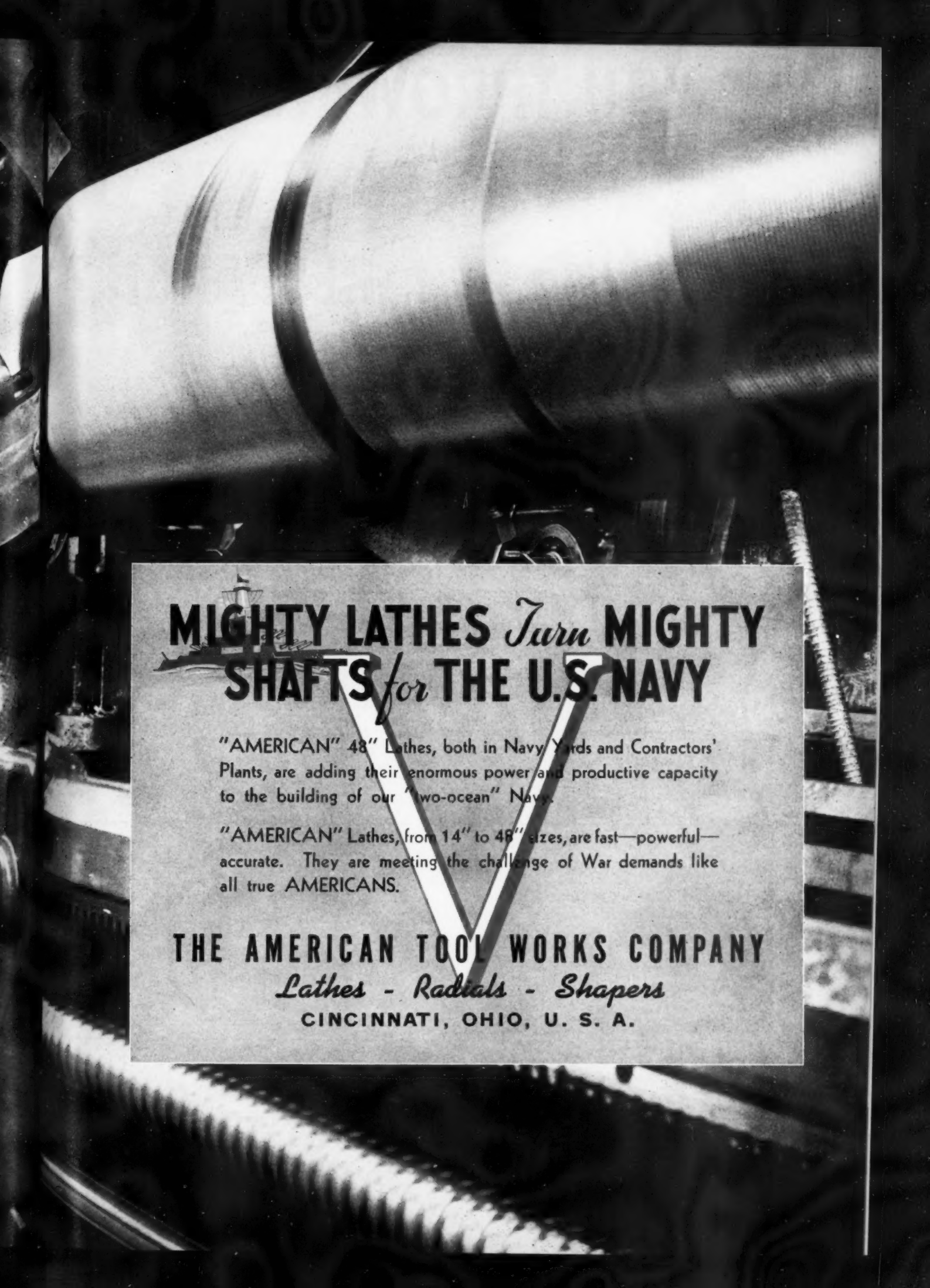
Yet in the hurly-burly of today we *think* of tomorrow, and tomorrow's tomorrow. And, as once before, Norton Company will be ready for the Peace to follow the sure victory of our armies. To this end we maintain and constantly guard those qualities which gained for Norton Company its national reputation for advanced *thinking* and *leadership* in the machine tool field.

NORTON COMPANY WORCESTER, MASS.

NEW YORK CHICAGO DETROIT CLEVELAND HARTFORD

NORTON MACHINES


"AMERICAN"
FOR
ALL OUT
PRODUCTION



MIGHTY LATHES *Turn* MIGHTY SHAFTS *for* THE U.S. NAVY

"AMERICAN" 48" Lathes, both in Navy Yards and Contractors' Plants, are adding their enormous power and productive capacity to the building of our "two-ocean" Navy.

"AMERICAN" Lathes, from 14" to 48" sizes, are fast—powerful—accurate. They are meeting the challenge of War demands like all true AMERICANS.

THE AMERICAN TOOL WORKS COMPANY

Lathes - Radials - Shapers

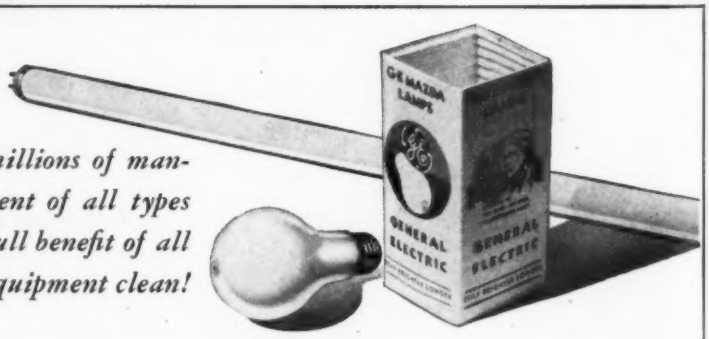
CINCINNATI, OHIO, U. S. A.

ARE YOU THROWING AWAY 29 YEARS OF RESEARCH?

WHEN you allow dust and dirt to accumulate on lamp bulbs and fixtures you may be throwing away as much as half the light you're paying for. That means you're losing the benefit of many years of General Electric lamp research. In the case of the 300-watt bulb, for example, you are throwing away the 40 per cent increase in efficiency effected by G-E research since the lamp was introduced in 1914.

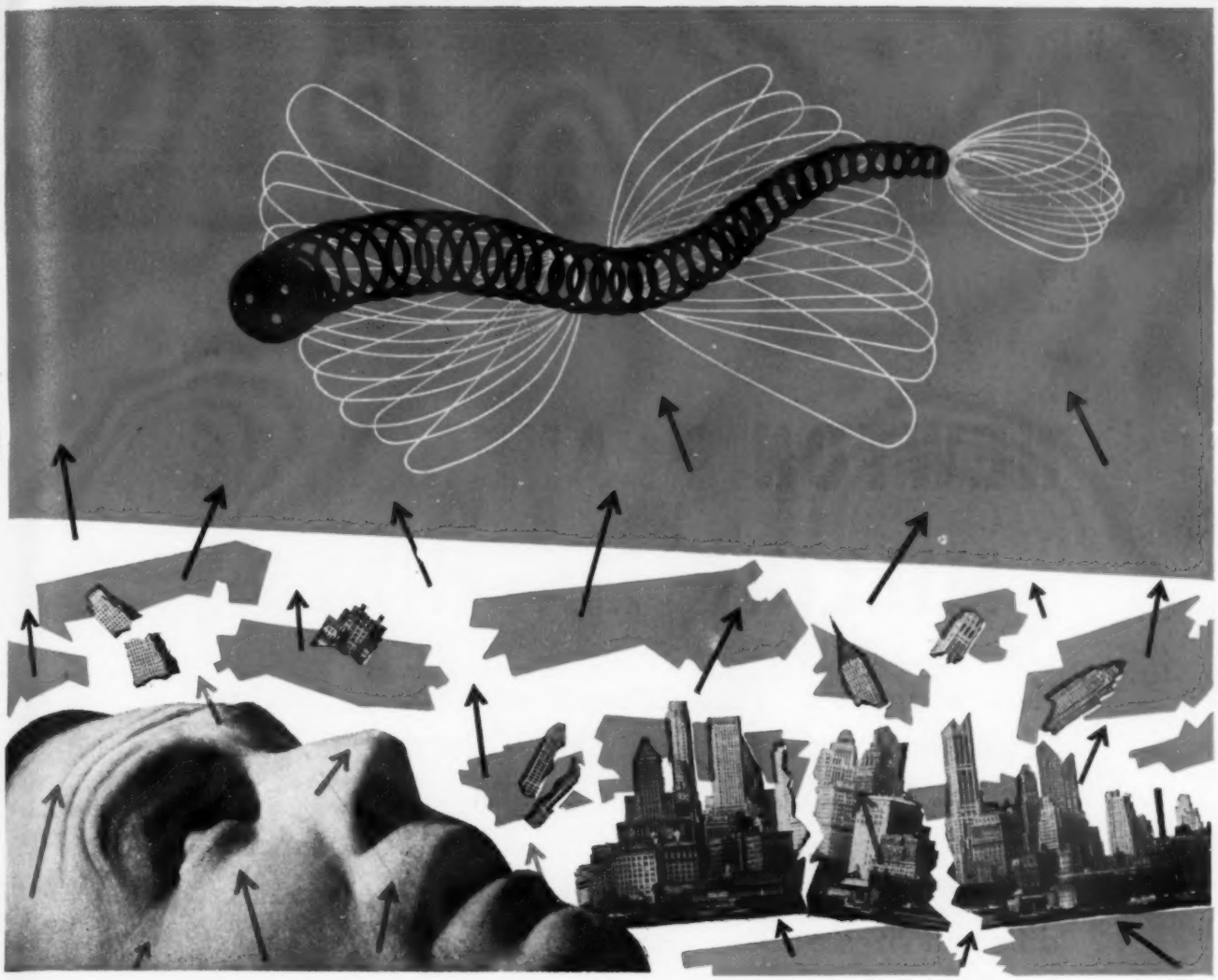
Why deny yourself the added light G-E research has given you? Start a regular cleaning schedule today! Get all the light you pay for! Where lighting units cannot be easily removed, a safety ladder should be used.

General Electric scientists have devoted millions of man-hours of research to the steady improvement of all types and sizes of G-E MAZDA *lamps. Get the full benefit of all the years of G-E research by keeping your equipment clean!*



G-E MAZDA LAMPS

GENERAL ELECTRIC



If worms had wings . . .

IF WORMS HAD WINGS, chances are our entire economy would collapse! All because their specialty—that of swallowing earth—is unique and indispensable!

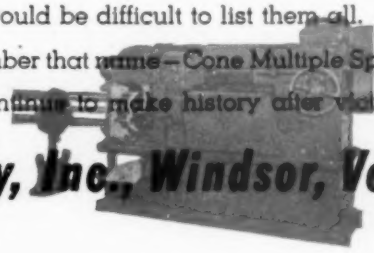
The earthworms in a single acre of ground carry more than 18 tons of earthy castings to the surface in a year! Thus, by constant plowing, they make it possible for air, moisture and life-giving minerals to circulate... and so for all plant-life to flourish!

But if worms had wings, they'd never be satisfied with so plebeian an occupation as burrowing. They'd just fly around. And in the meantime, the whole world would go to pot.

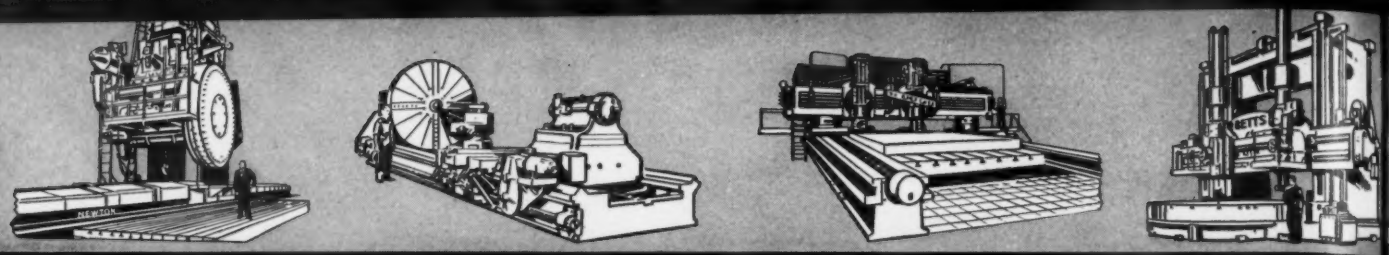
The moral is plain: Specialization is of so great importance that our modern world could not survive without it. Our democracy could not fight without it. Take machine tool production. We have overcome Germany's 7-year head start in about a year, and are even now outproducing the Reich in machine tools in the ratio of 5 to 1.

A potent factor in this production miracle has been the multiple spindle automatic lathe made by Cone. These titans of the machine tool industry are currently used in the production of so many different munition parts it would be difficult to list them all.

Remember that name—Cone Multiple Spindle Lathe. It will continue to make history after victory is won!



CONE Automatic Machine Company, Inc., Windsor, Vermont



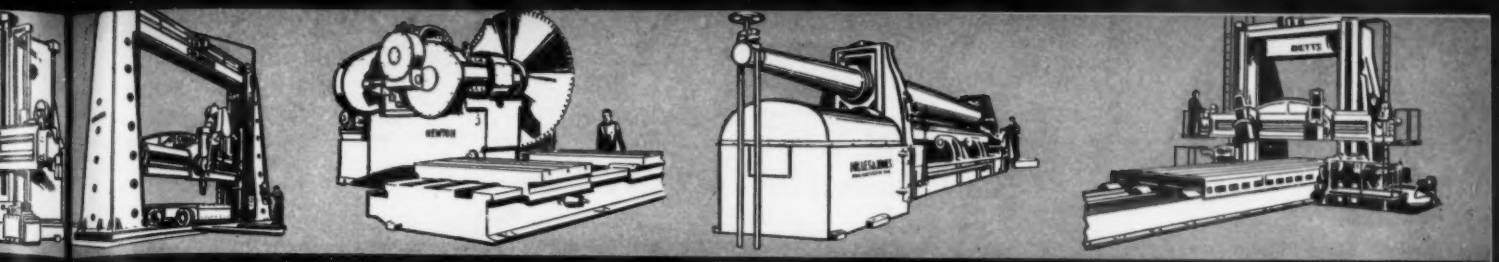
INCREASE YOUR CAPACITY WITH

NEWTON PLANER TYPE MILLING MACHINES

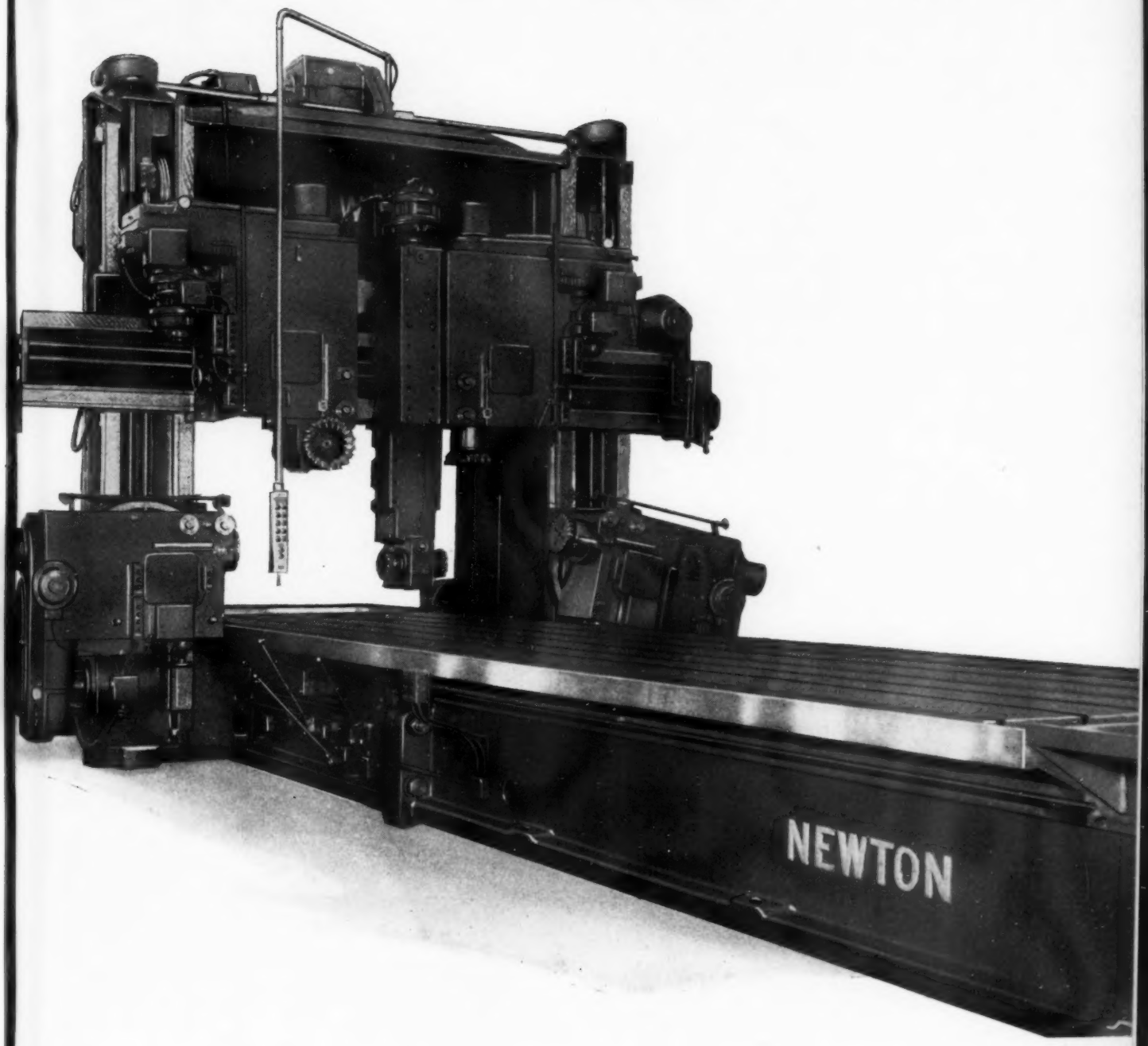
Here is another in the Consolidated line of Machine Tools that is out in the "front lines" of the battle of production. Newton Planer Type Milling Machines will handle a wide variety of work—fast and accurately. Designed and built for machining operations on many different sizes of Diesel engine frames and bases, this machine combines the accuracy and productiveness of a single purpose machine with the flexibility of a general purpose machine capable of handling a wide range of work.

All the modern features contributing to convenience and safety of operation, and to speed up production, have been incorporated into the design of these machines. They are built to stand up under the most rigorous service and to retain their accuracy throughout their long life.

Complete information on this machine or any of the other Consolidated Machine Tools will be sent on request.



THE CONSOLIDATED MACHINE TOOLS



BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED
MACHINE TOOL CORPORATION
ROCHESTER, NEW YORK

Horton chucks

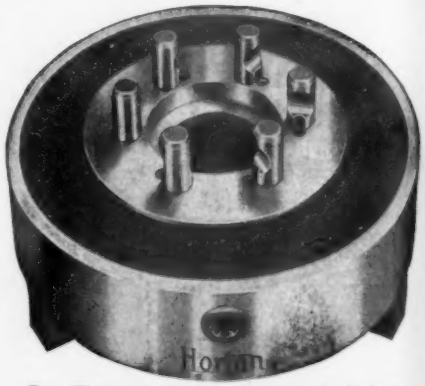
INDEPENDENT Solid Reversible Jaws Only

SCROLL UNIVERSAL Two-Piece Jaws Only

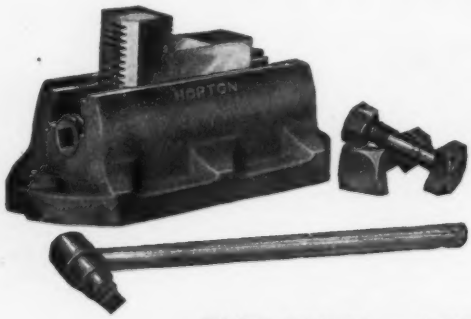
For Use With Intermediate Plates On Threaded Spindles

For Key Drive Tapered Nose Spindles

War Production Limited To These Essential Chucks



For Flanged Tapered Nose Spindles
Illustration shows chuck for Type D (Cam Lock) Spindle



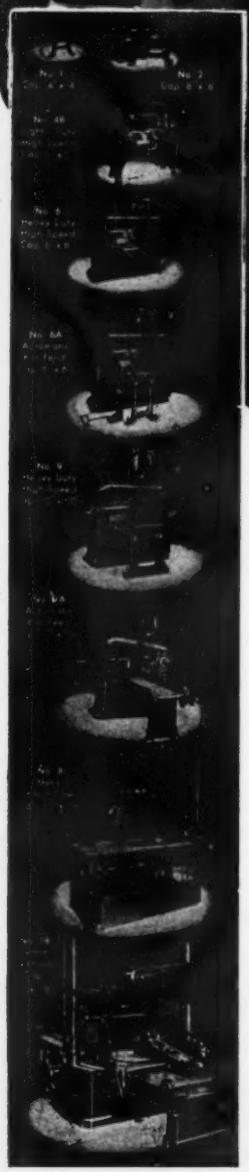
HORTON
MORROW

FACE PLATE and BORING MILL JAWS—Steel Body Only

SINCE 1851 .... THE E. HORTON & SON CO.
WINDSOR LOCKS, CONNECTICUT, U. S. A.

WOW!
WHAT A WALLOP
For 55 years, Kempsmith Milling Machines have proven their ability to "take it on the chin" and come back for more punishment. Today, Kempsmith power, ruggedness and speed are helping the United Nations win the grim battle of production.
KEMPSMITH MACHINE CO.
MILWAUKEE, WIS., U. S. A.
KEMPSMITH
KEMPSMITH
Precision Built Milling Machines Since 1888

MARVEL 9A
(capacity 10″ x 10″)
Cutting-off shafts at the
Monarch Machine Tool Co.

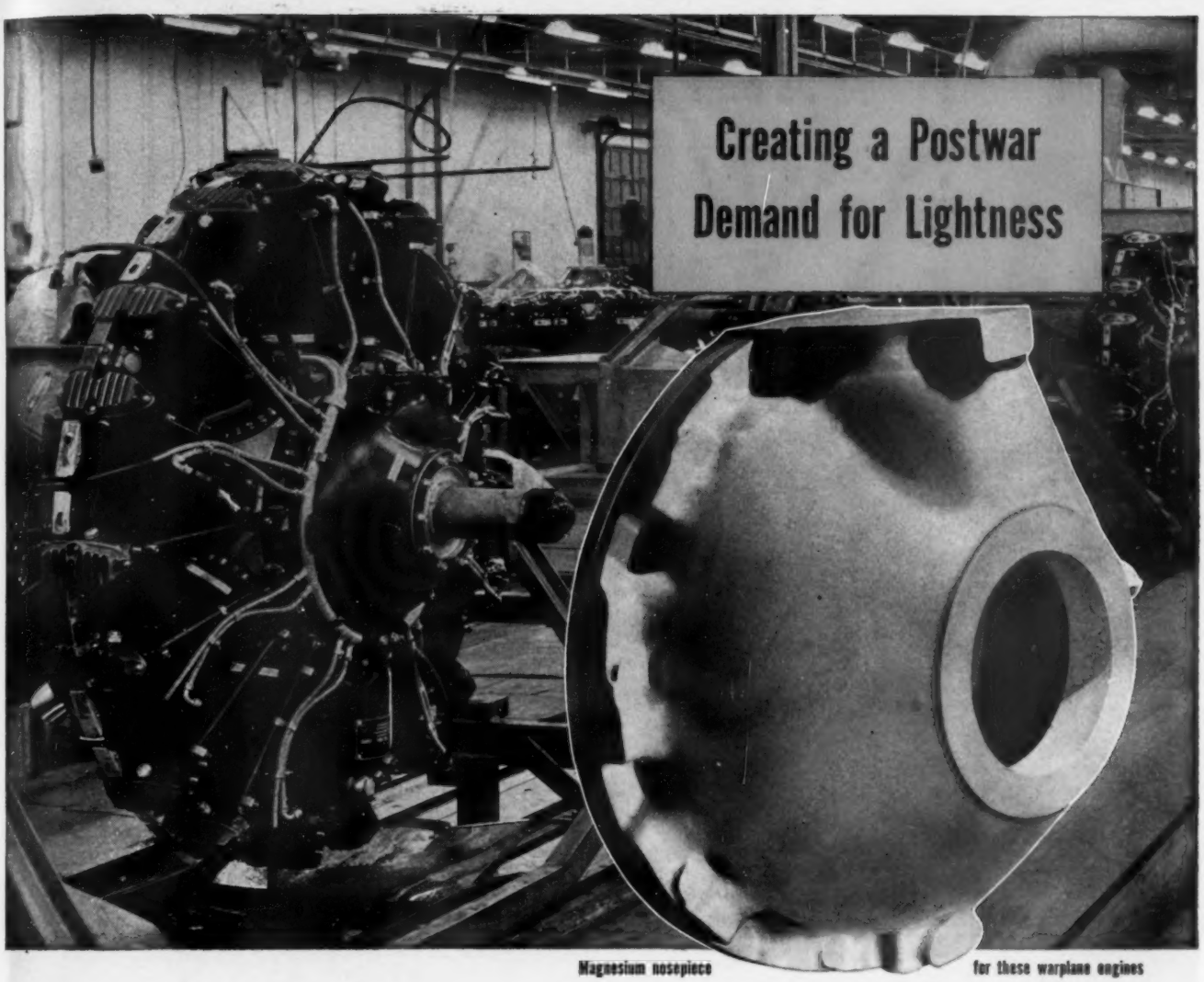


Fine Machine Tool Builders Know their Machine Tools!

• When the Monarch Machine Tool Co., builders of Monarch Precision Lathes, needed another cutting-off machine, they chose a MARVEL 9A Production Saw . . . one of MARVELS new heavy-duty, all-ball-bearing sawing machines with automatic bar push up. These are the fastest saws built—will cut-off more pieces, floor-to-floor, from single or nested bars than can be cut-off by any other method.

ARMSTRONG-BLUM MANUFACTURING CO.
"The Hack Saw People"
5700 Bloomingdale Ave., Chicago, U. S. A.
Eastern Warehouse & Sales: 225 LaFayette St., New York, N. Y.

MARVEL SAWS



Magnesium nosepiece for these warplane engines

Your designers may, for the first time, be turning to magnesium alloys, as they are called upon to save as much weight as possible in combat equipment. That, of course, is where all Mazlo Magnesium castings, forgings, sheet and shapes are going today. Plant men, too, are discovering the economies possible because of the high speeds at which magnesium can be machined. They are learning its fabricating techniques.

All of this experience will stand these men in good stead, as the present widespread use of magnesium alloys carries over into postwar production. "We made war materiel lighter with magnesium. Many peacetime products need that same dependable lightness."

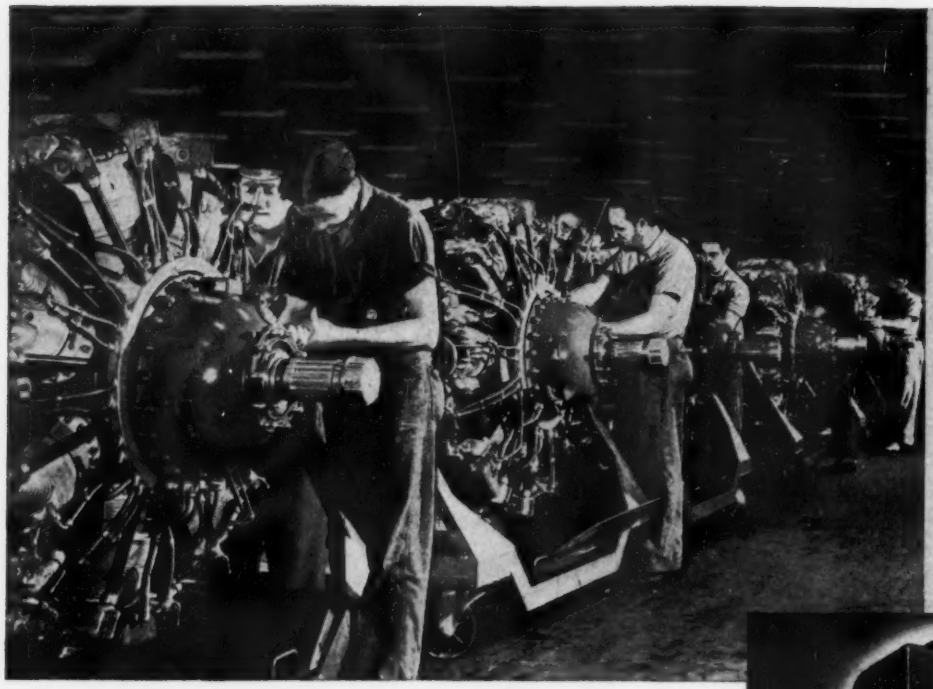
There'll be an abundance of Mazlo Magnesium Products for your use, when the war is over. And available, too, will be all of the experience gained by American Magnesium Corporation during the past twenty years. We are helping manufacturers employ magnesium to best advantage; developing new and improved fabricating methods that assure highest quality for users of Mazlo Magnesium Products. Sales Agent: Aluminum Company of America, 1709 Gulf Building, Pittsburgh, Pennsylvania.

MAGNESIUM MAZLO PRODUCTS

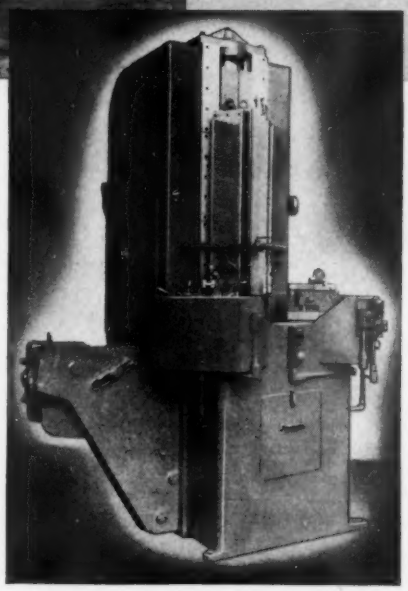
AMERICAN MAGNESIUM CORPORATION

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

LINES BEHIND THE LINES



FROM PRODUCTION LINES TO FIRING LINES, IN WAR AS IN PEACE, THE AUTOMOTIVE INDUSTRY DELIVERS THE GOODS

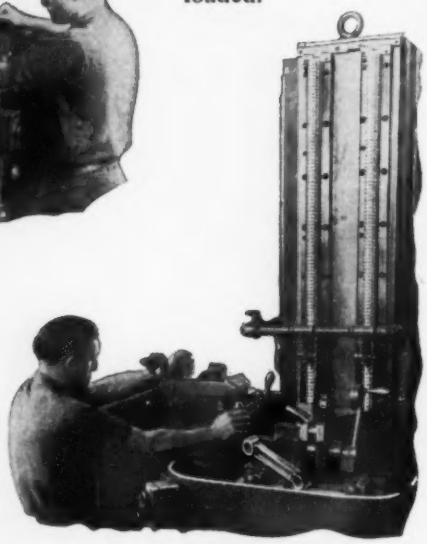


FAST PRODUCTION with high finish is obtained by broaching sides of articulated rod for aircraft engine, shown in position (left) on *American* SB-48-15-2 Single-Dual Machine.

NO INDUSTRY has gone more "all out" for war than the automotive. None manufactures a greater amount or variety of war matériel. For many years the industry has relied on broaching as a better way to do many metal-working jobs—the only *right* way to do some!

* * *

RELATIVELY LOW COST Single Ram Machine performs two different surface broaching operations. One tool (left) broaches flat on rod, while second fixture is being loaded.



RADII ARE FINISHED (right) with second broach while first fixture is being re-loaded. One operator plus one machine plus tooling by *American*—equals a precision job at a production rate!

BROACHING IS BETTER THE *American* WAY

American

BROACH AND MACHINE CO.

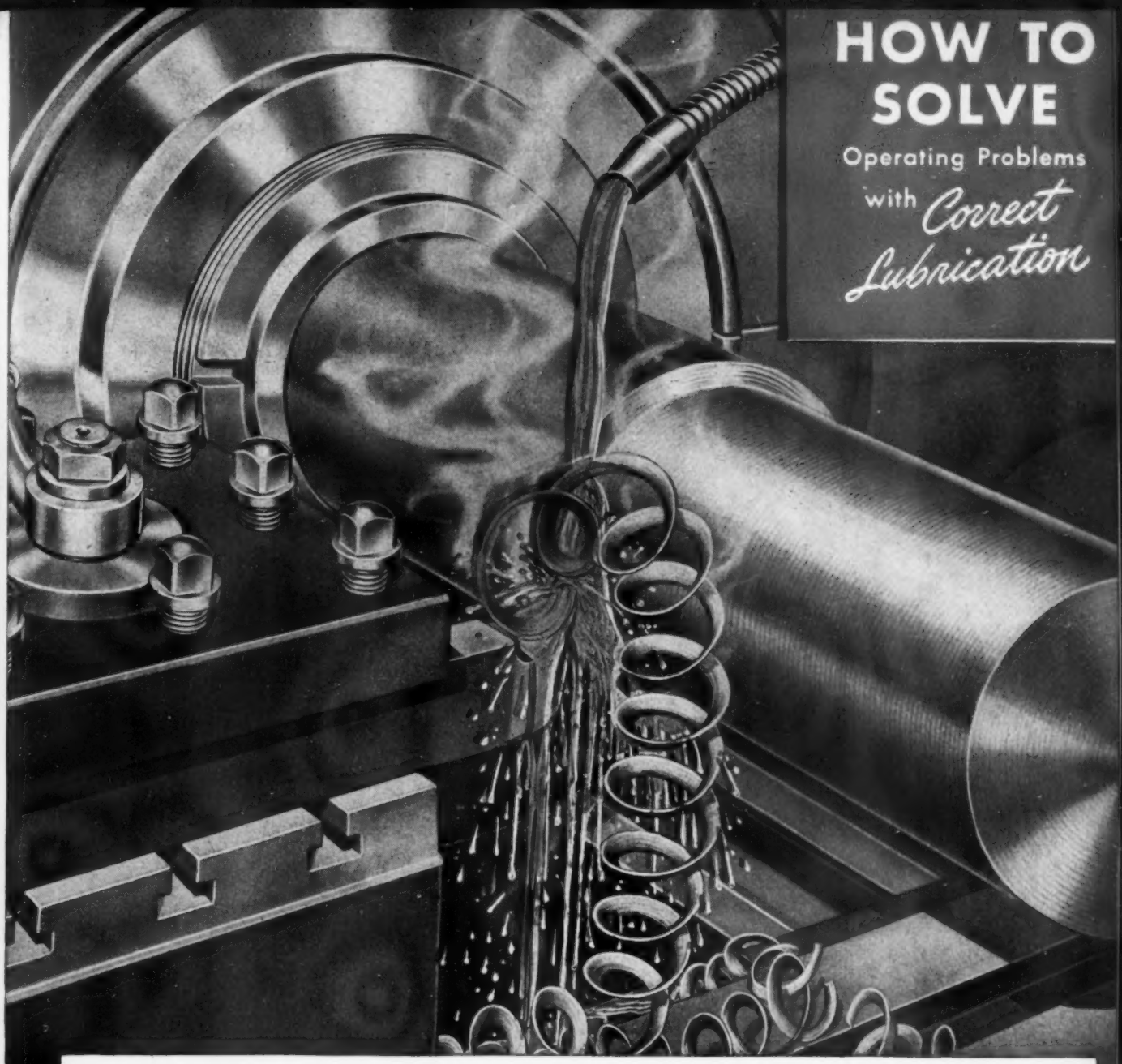
ANN ARBOR, MICHIGAN

•

BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS

ONE OF A SERIES OF SUGGESTIONS TO AID PRODUCTION



HOW TO SOLVE

Operating Problems with *Correct Lubrication*

No Smoking!

PROBLEM: When the cutting oil begins to smoke there's trouble afoot! It means that the friction between the chip and tool lip or between the work and the tool nose is producing more heat than the cutting oil can carry away. When tool temperature goes up, resistance to wear goes down. The rate of tool wear increases. Work finish suffers. Work size is not maintained, and rejects pile up!

ANSWER: First, make sure there is an adequate flow of oil. If the smoking continues, just cutting the oil back with a lighter-bodied mineral oil is not always the remedy, because this will decrease pressure-resisting, anti-welding and lubricity properties. *Friction increases!* What is needed is a correct balance of *all* properties. Our man will be able to recommend a S/V Sultran Cutting Oil that meets all requirements for your toughest job.

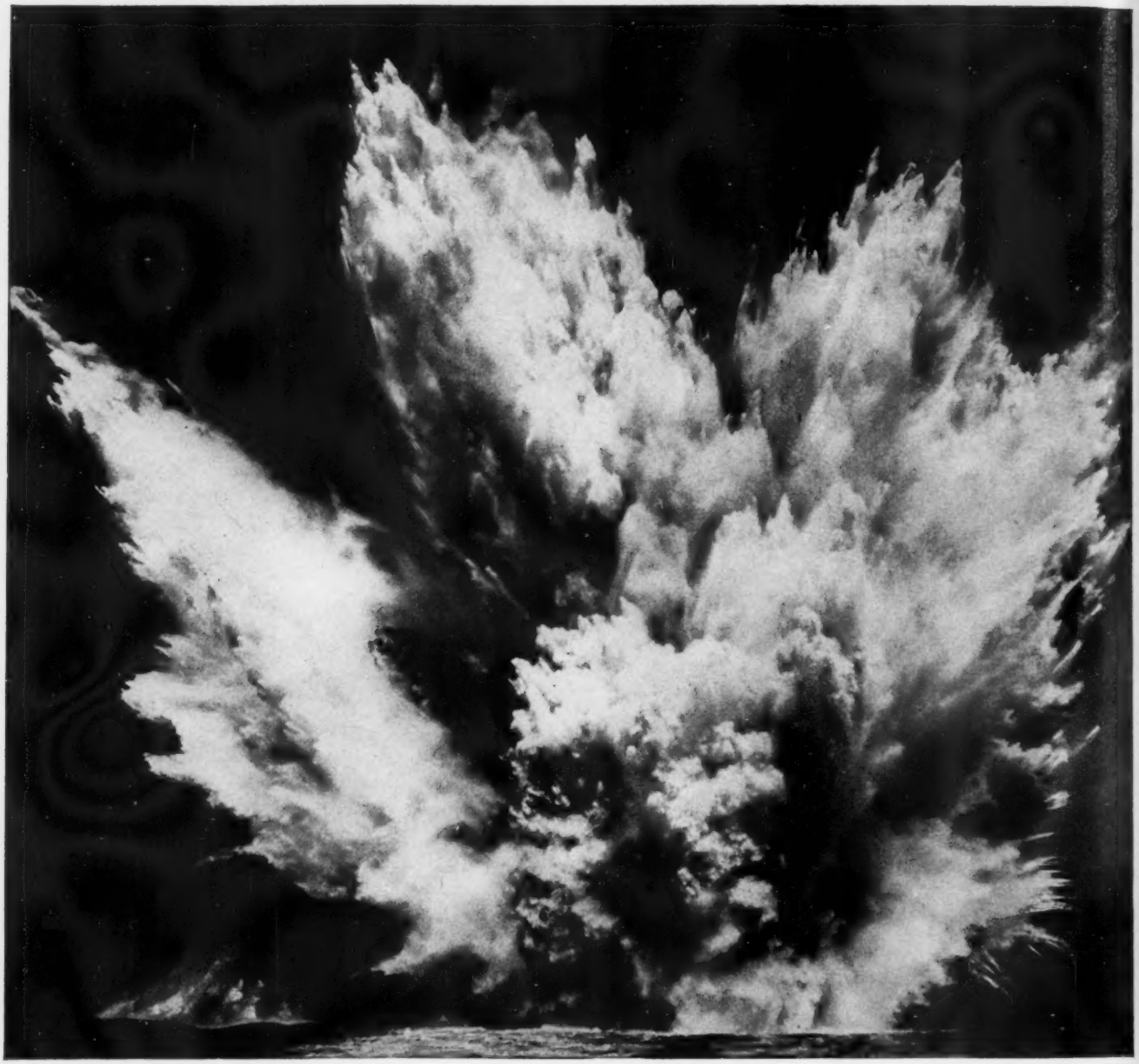
SOCONY-VACUUM OIL COMPANY, INC. — Standard Oil of N. Y. Div. • White Star Div. • Lubrite Div. • Chicago Div. White Eagle Div. • Wadhams Div. • Southeastern Div. (Baltimore) • Magnolia Petroleum Co. • General Petroleum Corp.

SOCONY-VACUUM

Lubricants

CALL IN SOCONY-VACUUM

ONE OF A SERIES OF SUGGESTIONS TO AID PRODUCTION



Air Conditioning gives it OOMPH!

This war is being fought with *explosions*. All kinds...from block-busters to hand grenades. And don't forget the explosions in the barrels of guns that propel bullets and shells toward the enemy.

It takes a lot of skill to make a good explosion. Air conditioning helps.

The rate at which powder *dries* determines the way it explodes. It must not explode too soon or too late. Hence, special air conditioning . . . with temperature and humidity controlled precisely . . . is used for the drying of powder.

Also, air conditioning protects the lives of workers in munitions plants by providing the safest temperature and humidity conditions.

General Electric is an outstanding supplier of the new improved kind of air conditioning equipment needed for these wartime requirements. It has developed equipment more flexible, more compact than ever before . . . with more accurate temperature and humidity control.

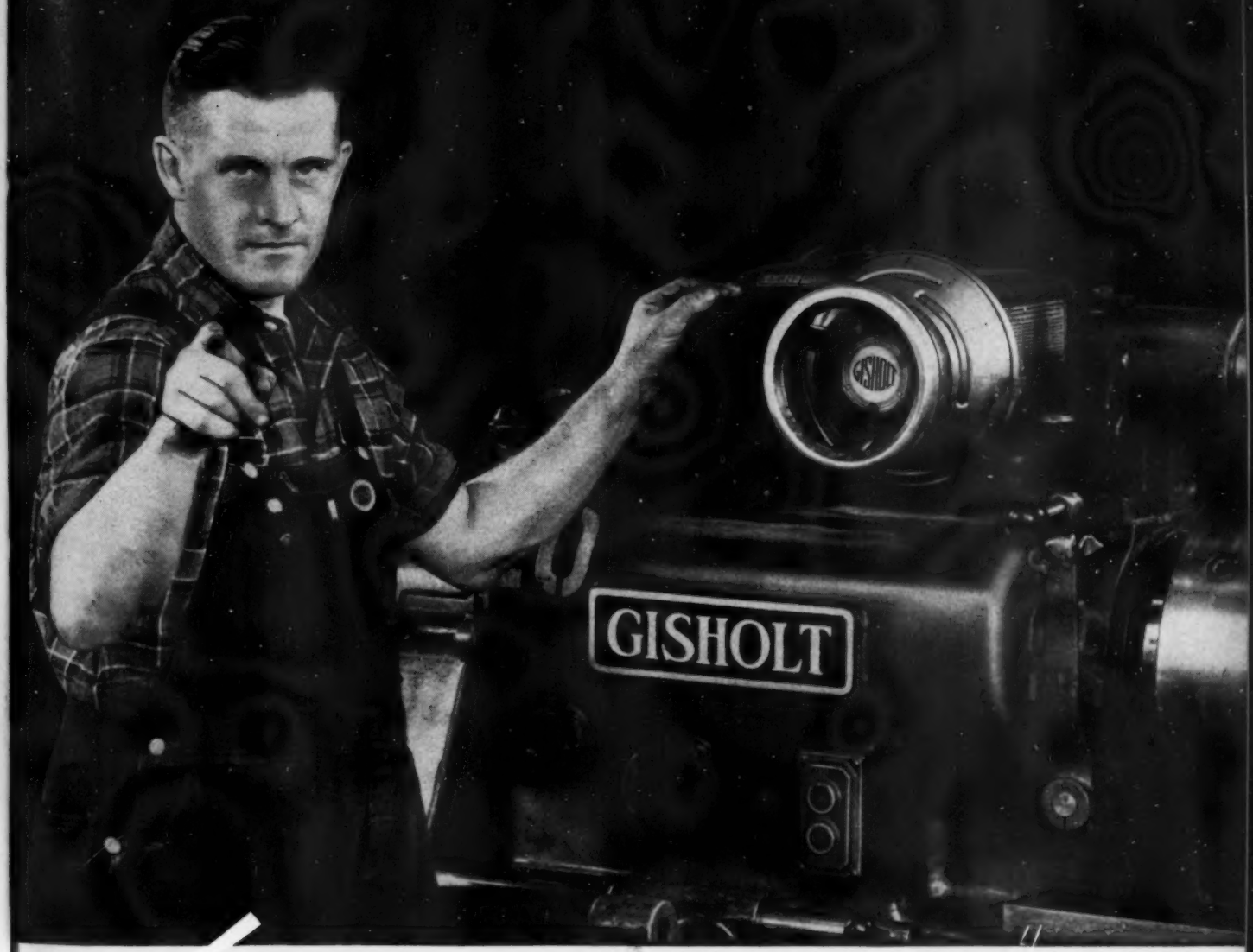
Today this equipment is being devoted to winning the war. After the war, a far better air conditioning will be made available for offices and factories, stores and theatres; homes, hospitals and hotels . . . from General Electric.

Air Conditioning and Commercial Refrigeration Department, Division 433, General Electric Co., Bloomfield, N. J.

Air Conditioning by **GENERAL ELECTRIC**

IF CLUTCHES SLIP

production slips, too!



KEEP ALL HEADSTOCK CLUTCHES PROPERLY ADJUSTED For six top speeds, check your forward and high speed clutches. For slow speeds, check your forward and low speed clutches. Never adjust a clutch so tightly that it won't fully engage. See instructions in your service manual.

GISHOLT

★ *Reprints of this page are available for bulletin board use in your turret lathe department. Write the Gisholt Machine Company, 1201 East Washington Avenue, Madison, Wisconsin. Ask for "War Time Care and Operation Poster No. 2." State quantity desired.*

What ever happened to the Horse Collar Market?

Who won the World Series in 1935? Who was vice-president under Harding? Of 1481 makes of American automobiles, 16 are known today. How many of the *others* can you name? And what ever happened to the carriage wheel business, and where's the horse collar market?

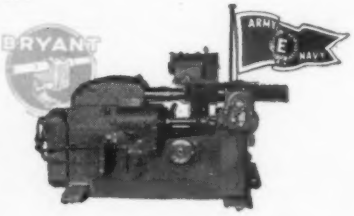
People, products, markets and methods all succumb to *change* . . . and today that powerful factor of change is doing more to disrupt markets, create new products, and revise production methods than most businesses are even remotely prepared for!

A soap company and a roofing company are operating shell-loading plants. Shipbuilders are building cargo planes. The automotive industry is producing farm machinery, locomotives, air conditioning equipment, and literally hundreds of other unrelated products. Manufacturers are this year spending hundreds of millions of dollars on research alone, and the day this war ends, a new age of production will begin.

Part of this story of change we know first hand, as only specialists can. That part is in the vital and highly specialized field of internal grinding . . . and this much we can tell you on the basis of our own experience with the amazing developments in production that we have seen and helped to produce:

If your business is manufacturing with metal, and if you are planning ahead today for the products you will manufacture tomorrow, the surest way to protect your business against failure from uneconomical production methods is to consult with the leading specialists in machine tool engineering.

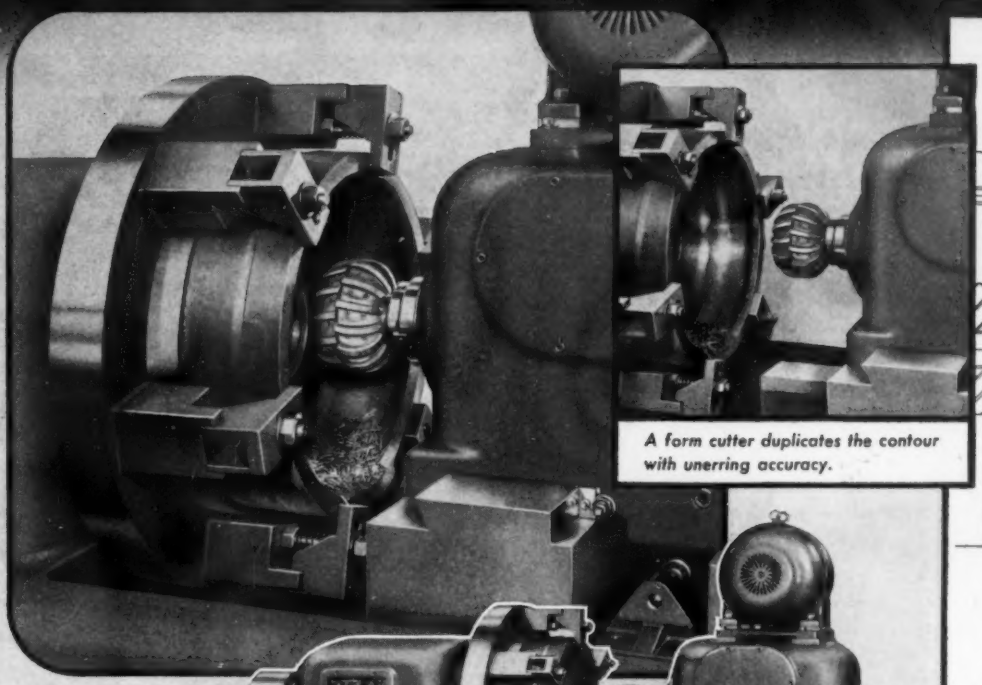
Bryant's Consulting Service is available to you at all times. Call upon us now!



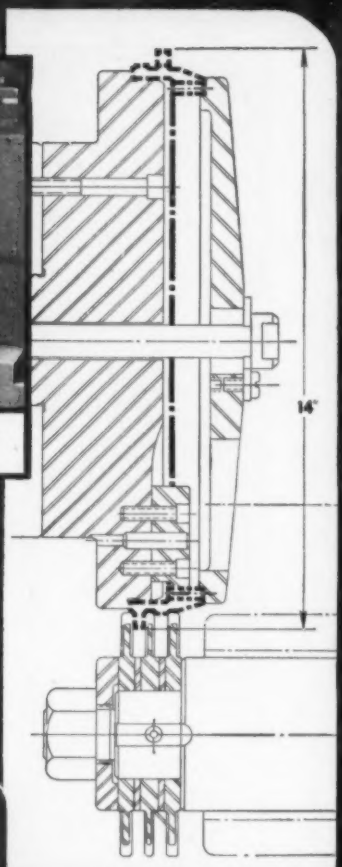
Bryant Chucking Grinder Company

SPRINGFIELD, VERMONT, U. S. A.

SEND FOR THE MAN FROM BRYANT



A form cutter duplicates the contour with unerring accuracy.

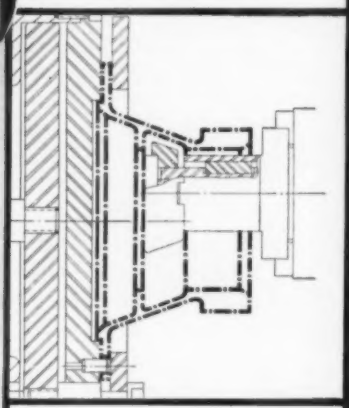


External operations with interrupted cuts are finished to close tolerances with the Cross Rotary Miller.

CROSS NO 13 *Rotary Milling Machine*

TOP ACCURACY—A GOOD FINISH—1/12 THE TIME is the story of machining Fluid Drive Housings with the Cross Rotary Miller. Automatic operating cycle with centralized push button control enables unskilled labor to achieve maximum results without scrap. Three models for small, medium and large work.

First and Foremost with Rotary Milling.



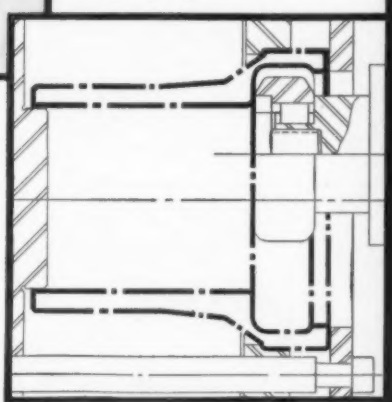
Irregular contours are processed in the usual way without special attachments or tooling.

CROSS GEAR & MACHINE CO.

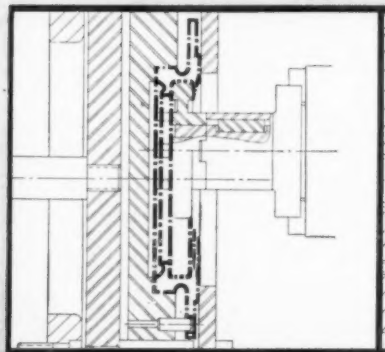
Established in 1898

DETROIT, MICHIGAN, U.S.A.

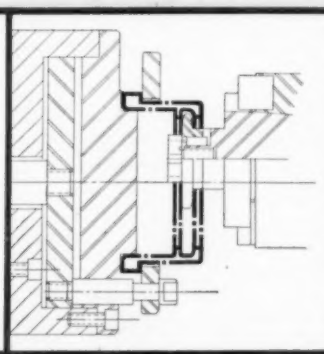
130



Deep internal contours can be finished in one operation with the Cross Machine.



Rotary milling is an ideal method for handling many difficult operations on aircraft parts.



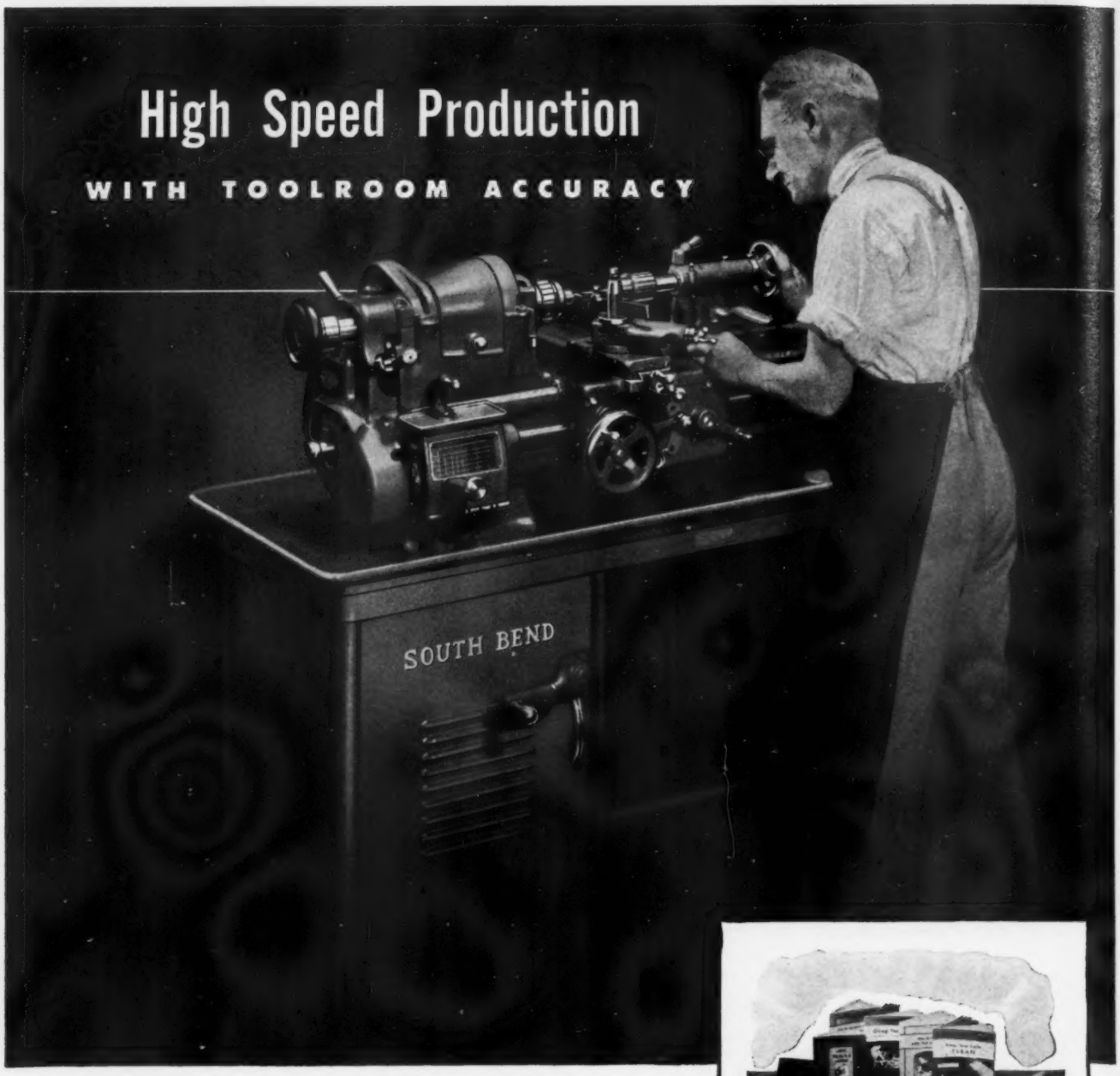
Multiple edge cutting tools with an enveloping cutting action satisfy the most exacting demands for fine finish.

SEND FOR THE MAN FROM BRYANT

IST

High Speed Production

WITH TOOLROOM ACCURACY



War Production demands maximum speed and absolute precision. Both of these requirements are met in hundreds of war plants with South Bend Lathes.

Their rigidity and wide range of spindle speeds permit taking full advantage of the higher cutting speeds possible with tungsten-carbide tools. Their dependable accuracy makes it possible to machine work with such precision that subsequent finishing operations can often be omitted.

South Bend Engine Lathes and Toolroom Lathes are made in five sizes, 9″ to 16″ swings. Write for a catalog and the name of our nearest distributor.

Use **THESE BOOKS AND FILMS ON LATHE OPERATION**

South Bend training helps — books, sound films, wall charts, and bulletins on the care and operation of a lathe — are available for training new operators. Write for Bulletin No. 21-C.

ARMY (E) NAVY

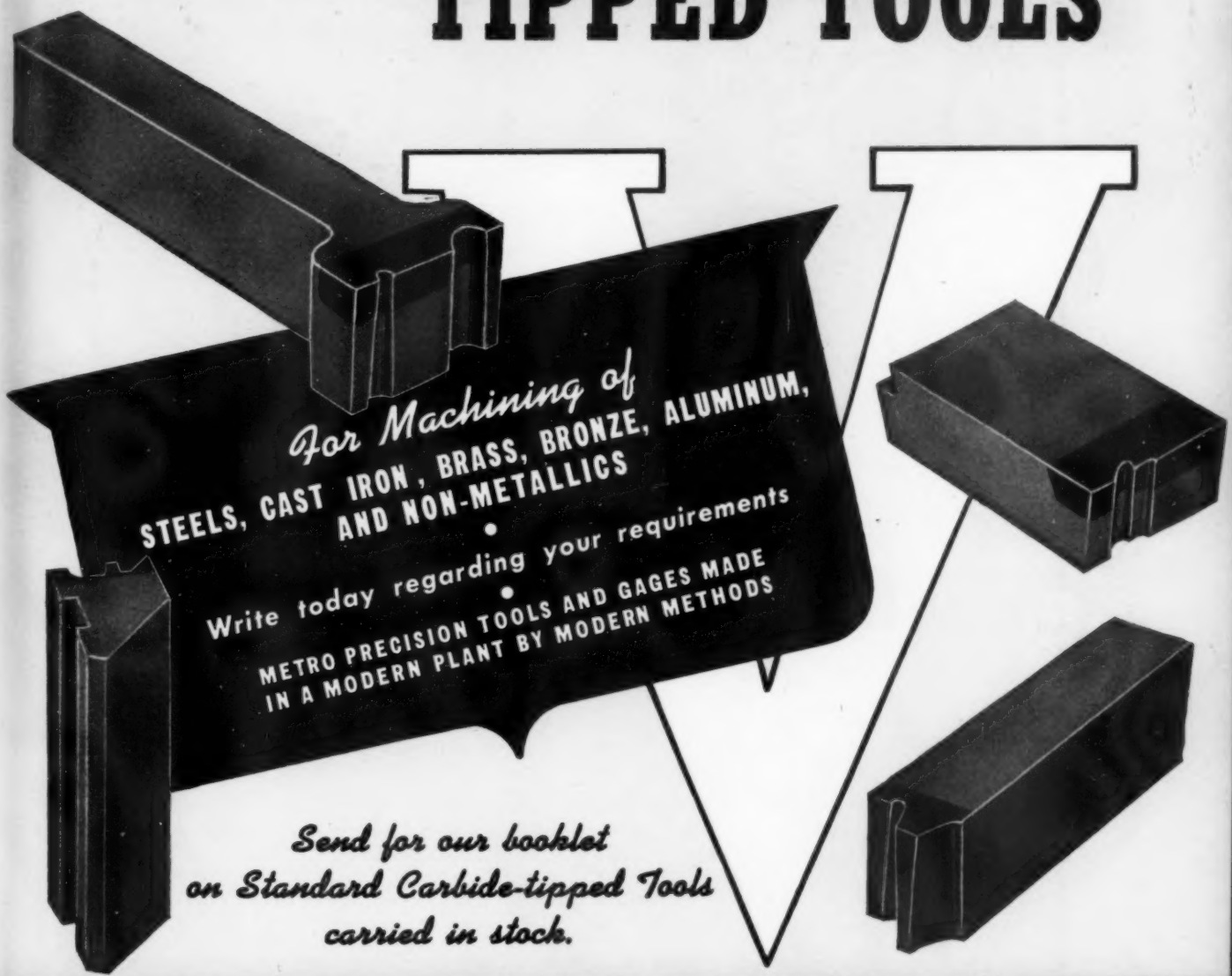
SOUTH BEND

SOUTH BEND LATHE WORKS

LATHE BUILDERS FOR 36 YEARS SOUTH BEND, INDIANA, U.S.A.

Special

CARBIDE TIPPED TOOLS



For Machining of

STEELS, CAST IRON, BRASS, BRONZE, ALUMINUM, AND NON-METALLICS

•

Write today regarding your requirements

•

METRO PRECISION TOOLS AND GAGES MADE IN A MODERN PLANT BY MODERN METHODS

Send for our booklet on Standard Carbide-tipped Tools carried in stock.

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TOOL AND GAGE CO.

4240 PETERSON AVE.

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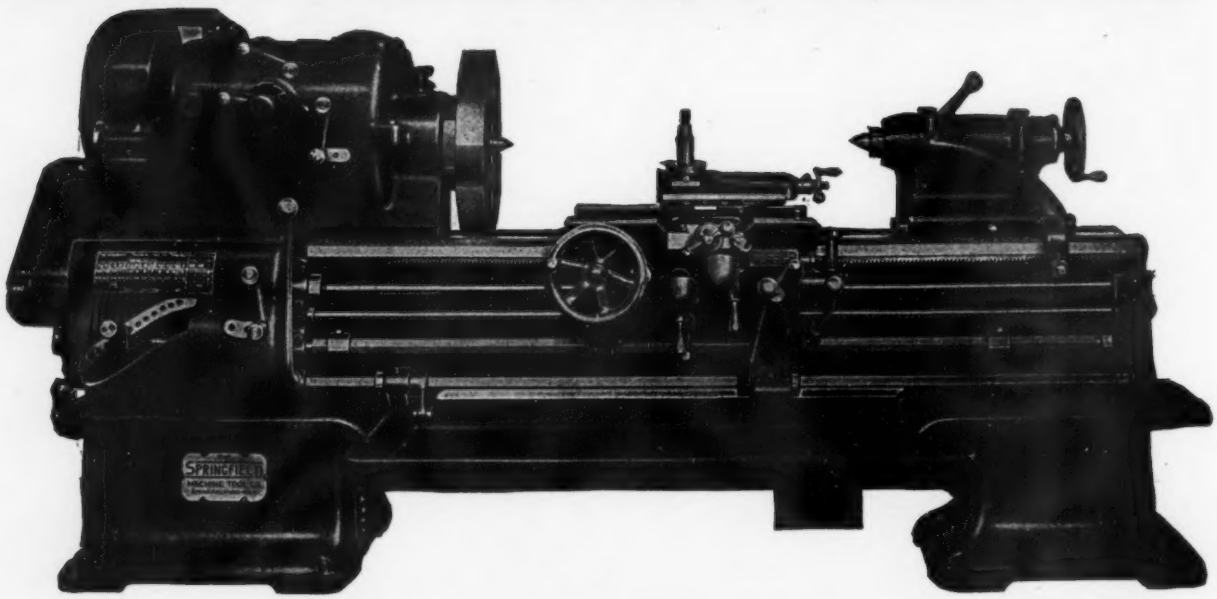
Choose SPRINGFIELD



GEARED HEAD LATHES

Many are the problems that face industry today, no small one being that of increasing production for war purposes. In this respect, you'll find it to your advantage to choose SPRINGFIELD Geared Head Lathes.

From the ground up, a SPRINGFIELD Lathe represents superior construction and design. All heavy castings, including the bed, are cast in our own shop . . . gearing is designed for maximum efficiency . . . attachments demonstrate unusual engineering ingenuity . . . lubricating systems and power transmission are built to take it, 24 hours a day. In fact, to fully understand what SPRINGFIELDS can do for you, check their superior metal turning records in other shops . . . and judge for yourself.

Under current emergency conditions, make it SPRINGFIELD Geared Head Lathes . . . they'll do your job better, now and later, too! Sizes range from 14" to 30". Write concerning deliveries, prices, etc.

The SPRINGFIELD MACHINE TOOL Co.

SPRINGFIELD OHIO U.S.A.

AN *Essential* TOOL HOLDER

A Willard Spring Tool Holder — is an "essential" in our war-time machine shops and tool rooms. New in design, the "Willard" is efficient, accurate and economical — can be used for all types of threading, coarse or fine. Adaptable to a wide variety of work. The spring feature prevents shock to the cutter — minimizes cutter breakage — makes possible faster and smoother feed with heavier cut. Economical because it eliminates chatter — damaged work is reduced to a minimum. Made in three sizes for ¼" - 5/16" and ⅜" square tool bits. Specify "Willard" for accuracy and economy. Write for further information.

Awarded to Auto-Ordnance Corporation for excellence in production of "Tommy Guns."

AUTO-ORDNANCE *Corporation*

THOMPSON TOOL DIVISION

342 WEST PUTNAM AVENUE, GREENWICH, CONN.

burned out motor

back on the job in 22 hours

BURNED-OUT MOTOR OF SPECIAL DESIGN RECEIVED 5:00 P. M. AT WESTINGHOUSE DISTRICT MANUFACTURING AND REPAIR PLANT. REPLACEMENT IMPOSSIBLE TO OBTAIN. MOTOR STRIPPED, REWOUND. STATOR DIPPED, BAKED, ASSEMBLED AND TESTED. DELIVERED TO USER FOLLOWING DAY, 3:00 P. M.—22 HOURS AFTER BREAKDOWN.

Westinghouse

DISTRICT MANUFACTURING AND REPAIR

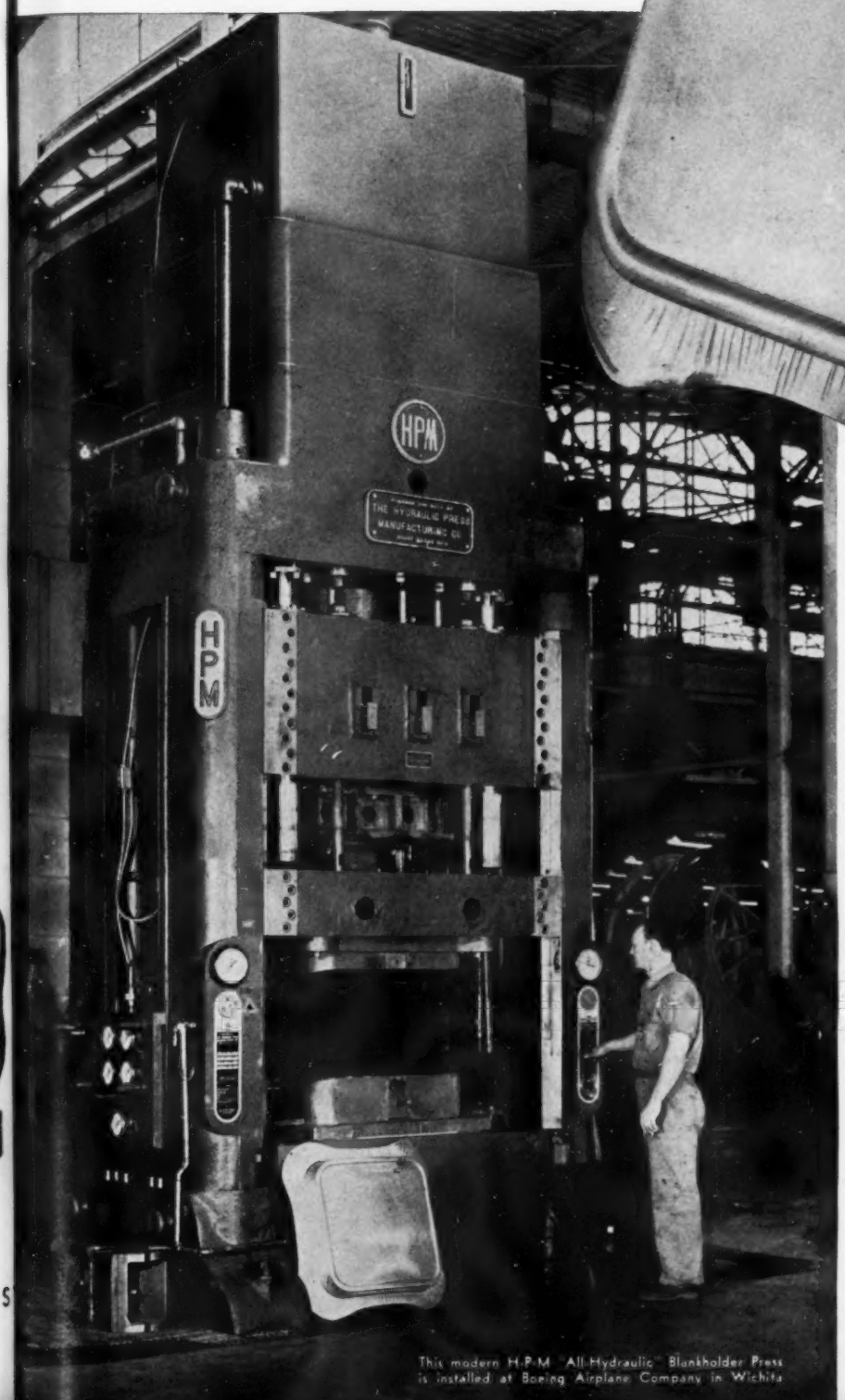
J-90468

***IF* THE EQUIPMENT NEEDING REPAIR IS VITAL TO THE WAR EFFORT . . . PHONE THE NEAREST OFFICE OF WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY FOR**

EMERGENCY SERVICE

33 M & R PLANTS . . . ONE NEAR YOU!

Aircraft Builders use
H·P·M BLANKHOLDER PRESSES
For Today's Mass Production of Deep Drawn Metal Parts . . .



This modern H-P-M "All-Hydraulic" Blankholder Press is installed at Boeing Airplane Company in Wichita

H-P-M FASTRAVERSE Presses, equipped with both hydraulic blankholder and die cushion, are designed to accommodate all standard types of steel and "Kirksite" dies. Die set-up is quick and simple. A single pump generates hydraulic pressure for all press actions. All strokes and pressures are adjustable, including variable pressure at each of the four corners of the blankholder slide. The H-P-M "valveless" Closed Circuit operating system guarantees a fast, smooth press cycle with shockless reversal. Write today for Bulletin 4206 featuring H-P-M Metal Working Presses.

THE HYDRAULIC PRESS MFG. COMPANY
Mount Gilead, Ohio, U. S. A.

District Sales Offices: New York, Syracuse, Detroit and Chicago—Representatives in Principal Cities

The dependable long life H-P-M HYDRO-POWER Radial Pump powers every H-P-M Hydraulic Press.

"PUT IT ON THE BLANCHARD"

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

Production

★ **Adaptability**

★ **Fixture Saving**

Operation Saving

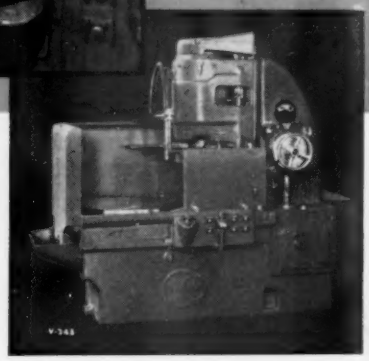
Material Saving

Fine Finish

★ **Flatness**

Close Limits

★ . . . . . *Especially valuable on jobs like the one illustrated.*



Grinding bearing caps on the Blanchard No. 18 Surface Grinder.

THE surfaces on these bearing caps were formerly milled in 34 to 40 minutes each — now they are Blanchard ground at the rate of 7 pieces per hour. The Blanchard No. 18 not only increases production, but decreases setting-up time and eliminates expensive fixtures.

The caps are laid on two parallel bars on the chuck. Smaller steel blocks are laid on top of them and against the caps. Two hollow steel rings against these blocks serve to hold the work sideways. A steel block is placed at each end and the magnetism is turned on.

¼" of stock is removed from the cast iron bearing caps to limits of +.010".

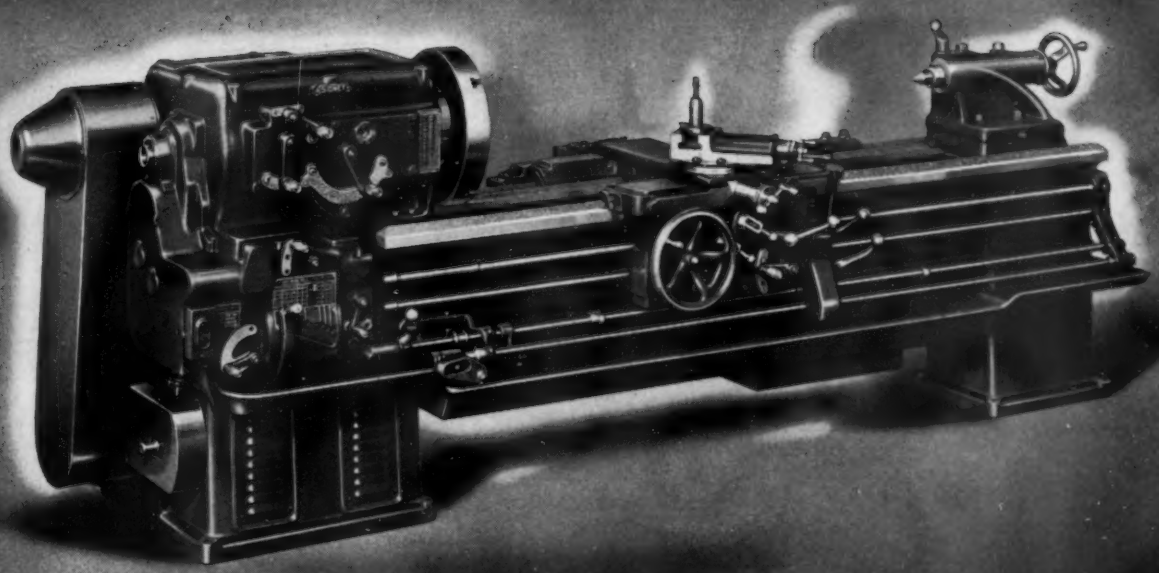
The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE, MASS.

BLANCHARD

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

Fire-Power on the Home Front



● Fire-Power in terms of Sidney Lathes is measured in smooth flow of power—stamina to take high speeds and heavy feeds—rigidity to maintain continued accuracy over 24 hour periods, month after month.

Such features as continuous tooth herring-bone geared head—center support for spindle and intermediate shaft in headstock—bed design that includes four walls and cross girts on twelve inch centers—spindle speed changes through internal and external gear tooth clutches are a few of the basic points of design and construction that permit Sidney Lathes to produce better work—more of it—over long periods.

Also the spindle center on the 18-20 inch lathe is only 42 inches from the floor—more convenient and less tiresome for the operator.

Full descriptive bulletin available—write.

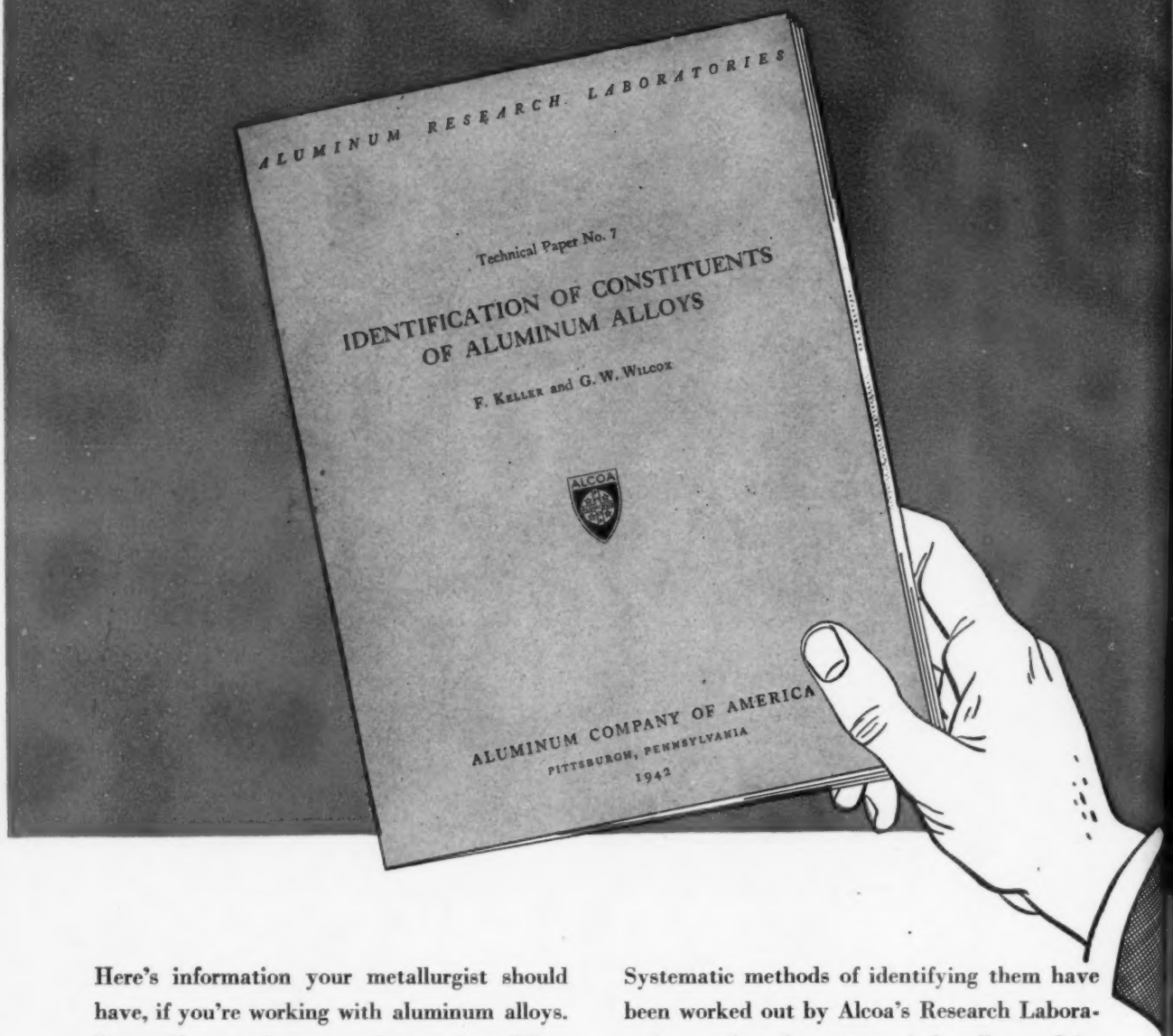
SIDNEY
THE SIDNEY MACHINE TOOL CO., SIDNEY, OHIO, U. S. A.
Lathes

The SIDNEY MACHINE TOOL Company

Builders of Precision Machinery

SIDNEY ESTABLISHED 1904 OHIO

To help your metallurgist tell "*Whats' in it?*"



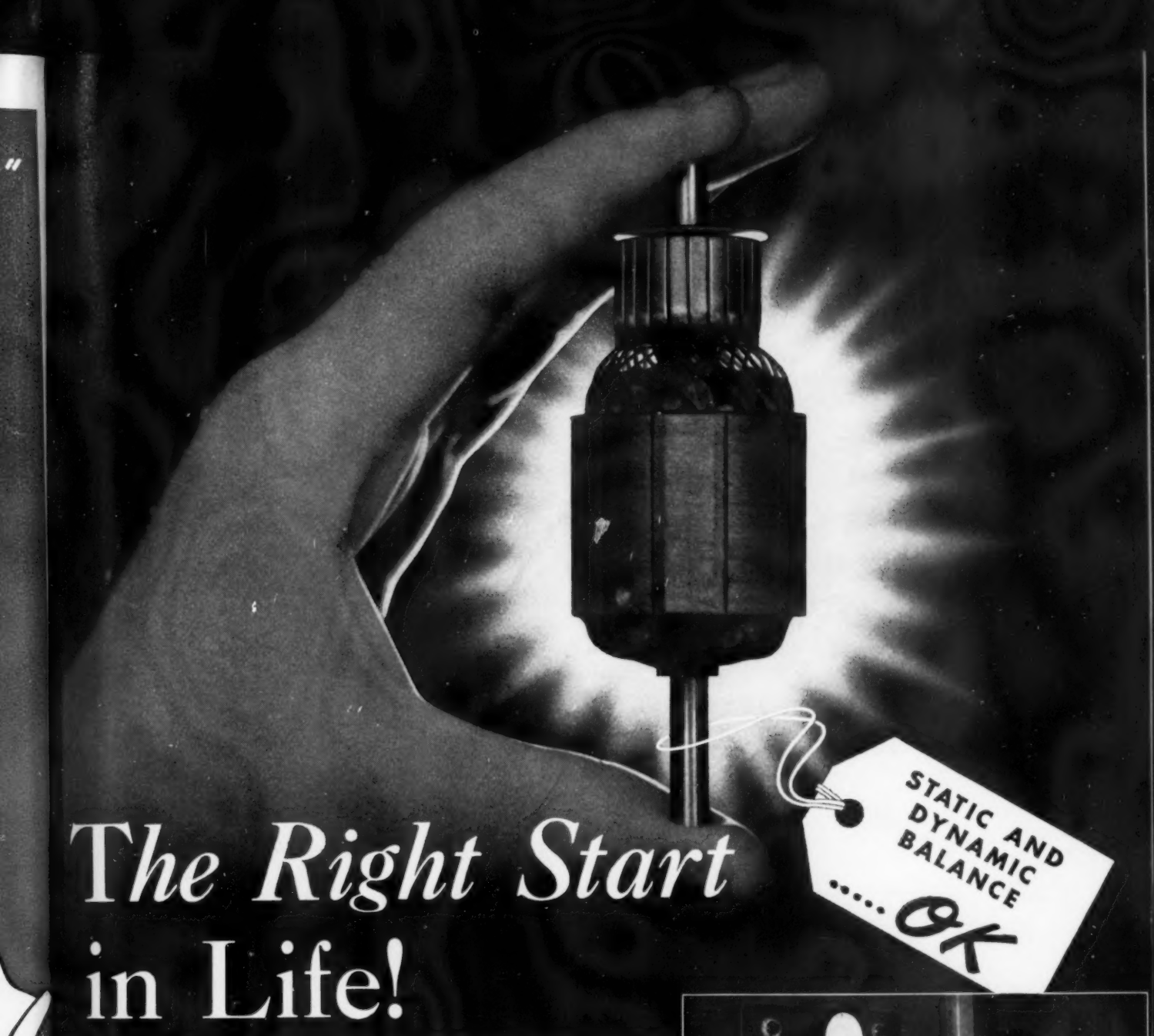
Here's information your metallurgist should have, if you're working with aluminum alloys. It provides a ready means of answering, "What type of aluminum alloy is it?"

Technical Paper No. 7 presents metallographic methods for examining aluminum alloys. How to prepare a specimen is told in detail; cutting the sample, mounting, polishing and etching.

Metals alloyed with aluminum form a variety of constituents of microscopic size. Systematic methods of identifying them have been worked out by Alcoa's Research Laboratories so that the nature of the alloy and its metallurgical treatment are revealed by the microscope. Chemical etching treatments color the constituents and reveal their form so that they can be identified by the systematic pictorial guide provided in this technical paper.

Your metallurgist may want a copy of Technical Paper No. 7. Write ALUMINUM COMPANY OF AMERICA, 2107 Gulf Bldg., Pittsburgh, Pa.

ALCOA ALUMINUM

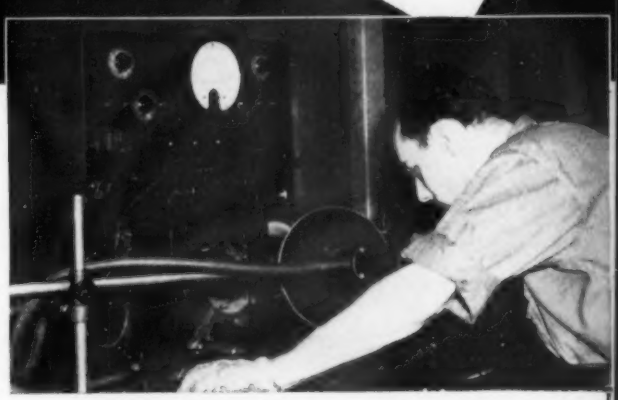


The Right Start in Life!

THIS armature is ready to go out into the world and do credit to its maker. It will serve faithfully—get along smoothly with other parts. It will "wear well" because it has that all-important attribute: *balance!*

To eliminate vibration, to protect bearings, and to assure long life, accurate static and dynamic balance are so vital that no high speed rotating part is ready to start life without them.

GISHOLT MACHINE COMPANY
1201 E. Washington Ave., Madison, Wis.



DYNETRIC BALANCING MACHINES
use the electron tube and stroboglow lamp to locate and measure unbalance more quickly and accurately than it has ever been done before. Dynetric Balancing Machines enable you to put this important work on a low-cost production basis.
Literature on request.

LOOK AHEAD... KEEP AHEAD... WITH GISHOLT IMPROVEMENTS

The Army-Navy "E" and the Treasury Flag fly side by side at Gisholt.

URRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

RIVETT

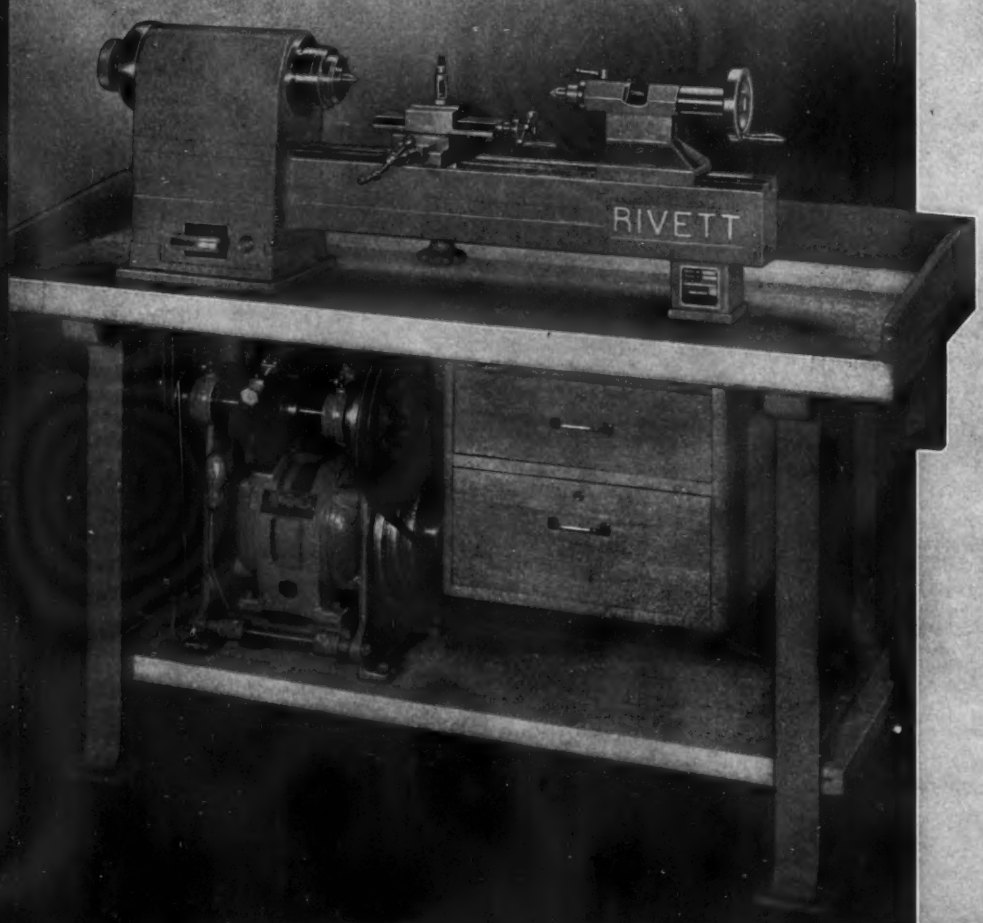
918 PLAIN BENCH LATHE

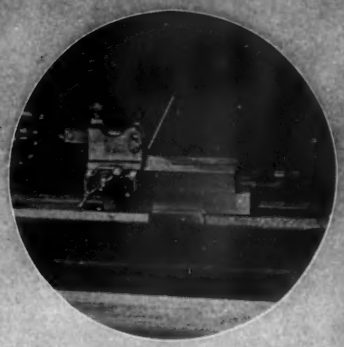
Revolutionizes Concept of Bench Lathe by Its Power and Vibrationless Performance

The Rivett No. 918 has been developed to advance the productive capacity of the plain precision bench lathe. Not only is it indispensable in the tool room and in light manufacturing, but it is capable of thousands of jobs often produced on heavy, costly machines. It has exceptional power, wide speed range, vibrationless performance; it is quickly set up, fast, accurate and trouble proof.

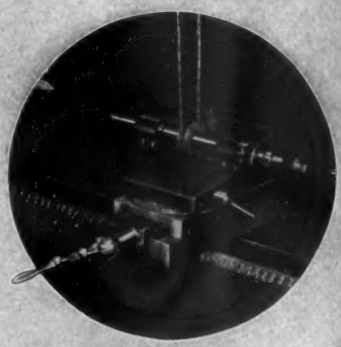
Operating convenience and long-life precision are well blended in the No. 918 design. Ball bearing spindle is mounted in rugged headstock enclosure supported by heavy box sectioned bed. Long taper key drive spindle nose assures true running and positive drive for chucking attachments. Slope mounting automatically squares compound slide rest with line of centers. Convenient control switch operates spindle drive. All driving vee belts are adjustable and may quickly be replaced without disturbing the lathe or drive assembly or removing the spindle from its bearings.

The No. 918 is furnished with bench or steel cabinet mounting and has a wide selection of attachments.

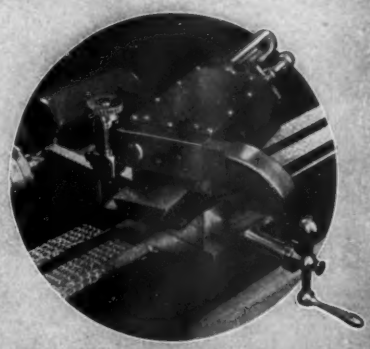




Slotting Attachment



Universal Grinding Attachment



Automatic Slide Rest

SPECIFICATIONS

Swing over bed, dia.	9"
Distance between centers	18"
Collet capacity, max. dia.	1"
Step chuck capacity, max. dia.	6"
Jaw chuck capacity, max. dia.	6"
Spindle capacity, max. dia.	1⅛"
Slide rest, travel of tool post slide	5¼"
Slide rest, travel of cross slide	5¼"
Tailstock spindle travel	3½"
Spindle speeds, eight forward and reverse	
Low range	150-2500 r.p.m.
High range	225-3750 r.p.m.
Weight of lathe, mounting and drive, net	850 lbs.

For Further Description Write for Bulletin 918

RIVETT LATHE & GRINDER INC.

BRIGHTON BOSTON, MASS.

FOR FASTER, BETTER MILLING

A "HYPER-MILL"

A NEW DESIGN AND AN IMPROVED CARBIDE

that . . .

Perform at extraordinarily high cutting speeds;
Permit the milling of heat-treated alloy steels;
Produce highly burnished surfaces;
Result in a high production rate.

The new design and the improved carbide are described in our "Hyper-Milling" Bulletin FE-106, which is yours for the asking.

Firth-Sterling
STEEL COMPANY

Offices: McKEESPORT, PA. NEW YORK - HARTFORD - PHILADELPHIA
CLEVELAND - DAYTON - DETROIT - CHICAGO - LOS ANGELES

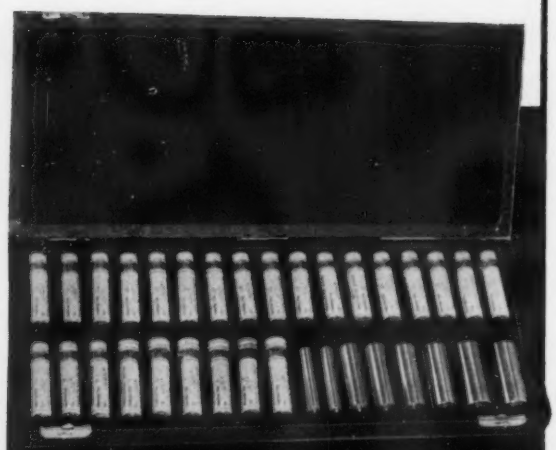
Use Tungsten-Titanium Carbide

The selection of Firthite Tungsten-Titanium Carbide for milling and almost all other **STEEL-CUTTING** operations avoids the use of Tantalum—a "scarce" and "critical" material.

FIRTHITE

FIRTHITE

THE "HYPER-MILLING" CARBIDE



How to use Van Keuren THREAD MEASURING WIRES

to meet today's specifications on precision threaded parts...

The pitch diameter of a screw thread is the diameter where the thickness of the thread equals the width of the space between threads. The only sure method of knowing that this diameter is within the limits specified on the drawing is to make measurements by the three wire method. Errors present in the thread form, thread angle, and lead may cause parts to be rejected on pitch diameter even if they appear acceptable with Go and No Go thread gages.

The pitch diameter of a threaded part is easily measured as follows: Given a 1"—8 National Form thread.

PROCEDURE	COMPUTATIONS	
1. Select "Best Size" wires for 8 threads per inch.	Size of wires =	.07217"
2. Place 2 wires in adjacent thread spaces and 1 wire in the opposite thread space and make the micrometer measurement over the 3 wires. See illustration.	Measurement over wires =	1.02950"
3. Subtract wire constant given on Van Keuren label		.10826"
Pitch diameter =		.92124"
4. Subtract the basic pitch diameter		.91881"
The pitch diameter is oversize		.00243"

Note: The basic or theoretical pitch diameter will be specified on the drawing or it may be found by subtracting the thread depth (see table on page 24 of The Van Keuren Catalog #31) from the outside diameter. The basic pitch diameter of a 1"—8 thread is 1.00000"—.08119" = .91881".

Consult the Van Keuren Catalog No. 31 for complete information.

MEASURING WIRES

PITCH 8 SIZE .07217"

Formula For 8 Pitch 60° Thread

Pitch Dia. = Measurement over Wires. — .10826"

THE VAN KEUREN CO.
BOSTON, MASS.

"ULTIMATE ACCURACY"

THE *Van Keuren* COMPANY 176 WALTHAM ST., WATERTOWN, MASS.

Light Wave Equipment · Light Wave Micrometers · Gage Blocks · Taper Insert Plug Gages · Wire Type Plug Gages · Measuring Wires · Thread Measuring Wires · Gear Measuring System · Shop Triangles

PHOTO BY U. S. ARMY

P&J

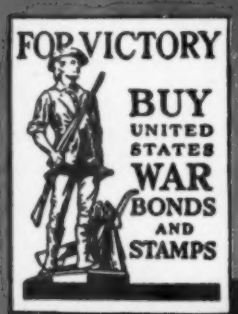
Automatic
CHUCKING EQUIPMENT
goes "all-out" to win the Battle of Production

The outstanding performance of P&J equipment can be attributed to its strength, power, versatility in tooling and operative convenience.

These features play a vital part in successfully performing the task of producing duplicate parts for weapons of all kinds at top speed and with maintained accuracy.

Airplanes, airplane engines, tanks, Bofors guns, 90 mm anti-aircraft guns, machine guns, adaptors for shells, American Oerlikon guns and other war material are coming off production lines in ever-increasing quantities because P&J machines are carrying an important part of the responsibility for producing them.

P&J engineers offer their specialized experience in parts production to help you get the maximum performance from your equipment.



The POTTER & JOHNSTON MACHINE COMPANY

Pawtucket, R. I.

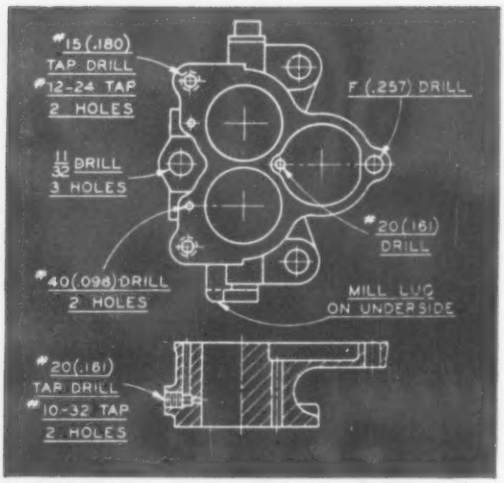
Contribute your "ALL" NOW in the "ALL-OUT" to win quickly

BUY MORE WAR BONDS

FLEXIMATIC

The THRIFTY Way

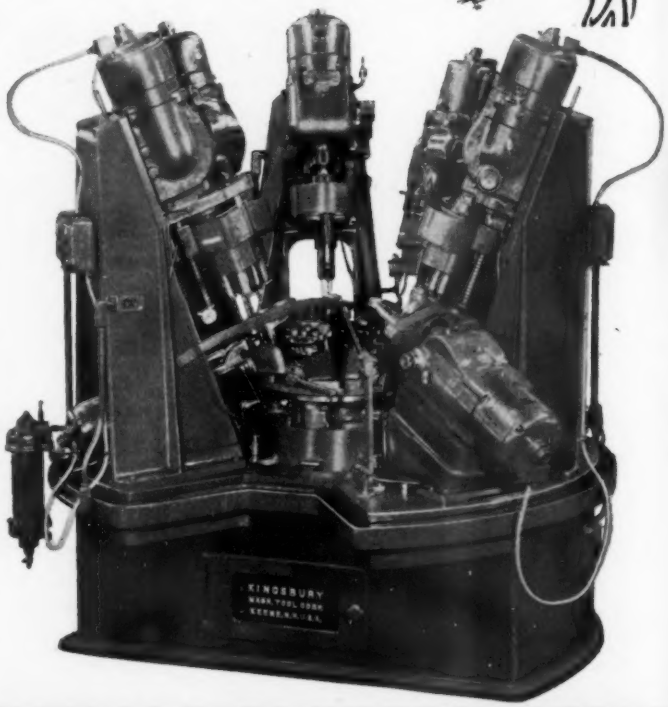
To Solve Production Problems



THIS IS A FLEXIMATIC JOB!

Over a dozen operations on the carburetor throttle valve bodies shown — and Kingsbury FLEXIMATICS perform the entire job in a single chucking of the work! An example of the thrifty way to solve multiple-operation production problems.

FLEXIMATICS are built up of standard Units, set up on a standard base around an automatically indexing work-holding turret. This unit system of construction keeps first costs low—out of the "special machine" class. And in addition, FLEXIMATIC Units can be changed, moved around and mounted in any combination on the base to meet the machining requirements of many different parts. That is why we say that **flexible automatic** FLEXIMATICS are the THRIFTY way to solve production problems.



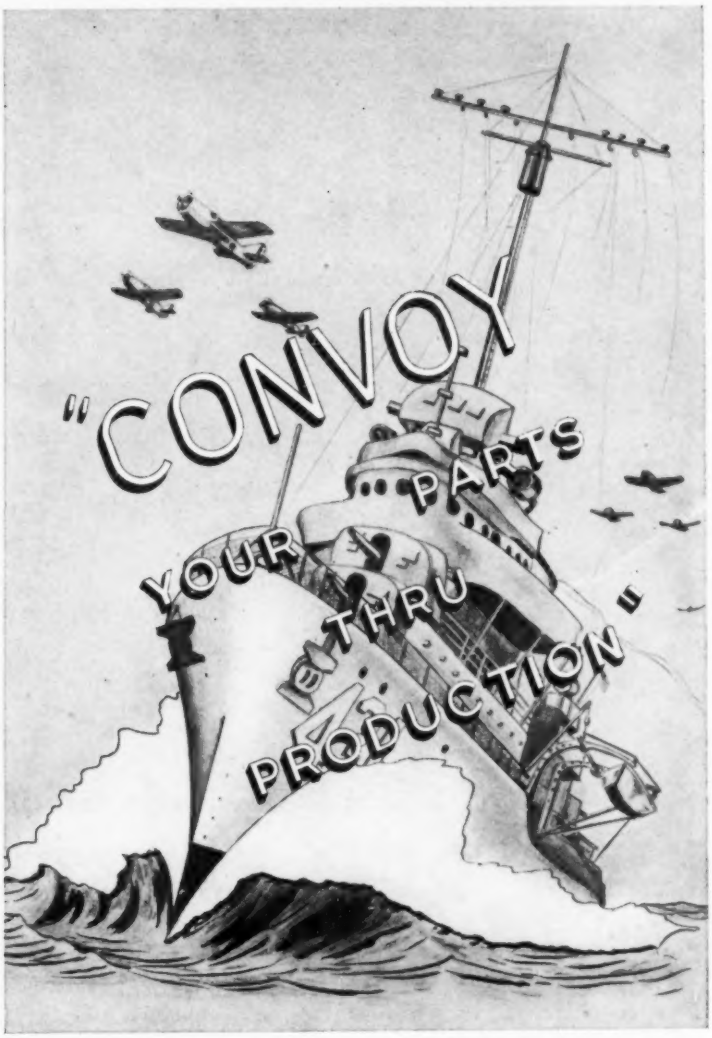
KINGSBURY MACHINE TOOL CORPORATION

KEENE · NEW HAMPSHIRE · U. S. A.

Machine & Tool Progress Exhibition, Milwaukee, Wisconsin
March 25 to 27

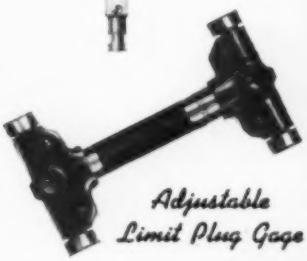
STANDARD Gages

Dial Bore Gage

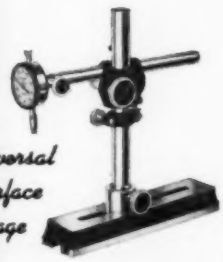


Test Indicator

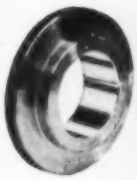
Snap Gage



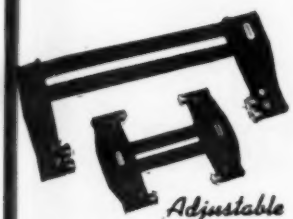
Adjustable Limit Plug Gage



Universal Surface Gage



Cylindrical Ring Gage



Adjustable Limit Length Gage

Depth Gage

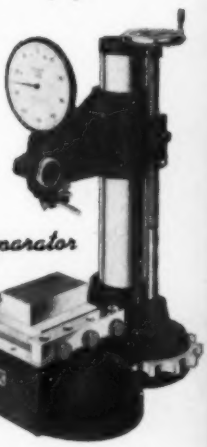
Dial Pin Gage

Master Disc

Adjustable Limit Pin Gage

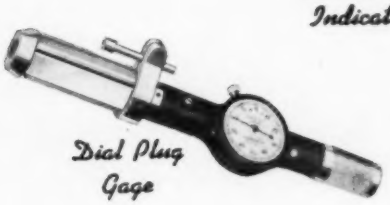
Dial Indicator

Cylindrical Plug Gage



Comparator

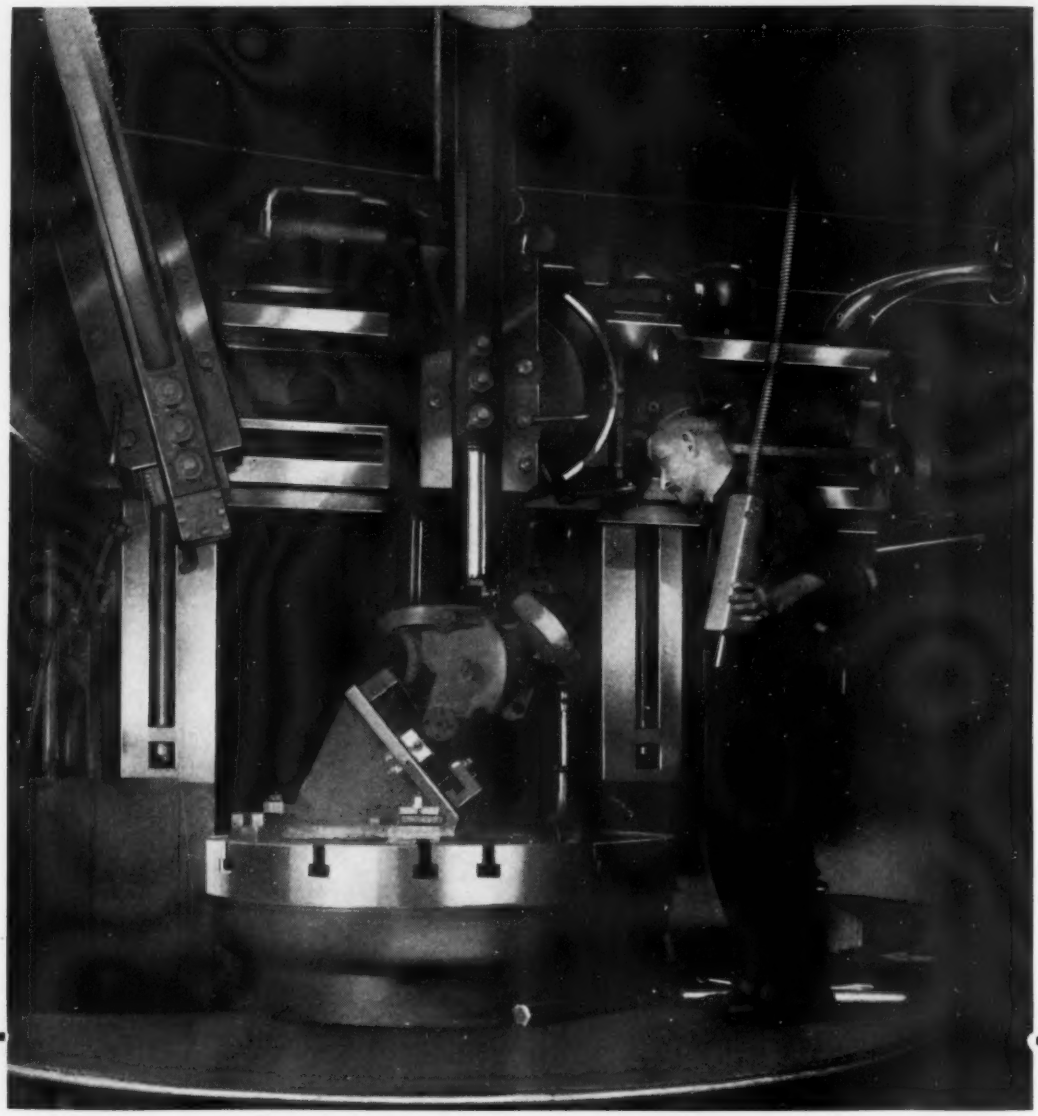
Special Gage



Dial Plug Gage

Dial Snap Gage

STANDARD GAGE CO., INC. —— POUGHKEEPSIE, N. Y



KEEPING OUR FLEET "FIT"
KING Vertical Boring and Turning MACHINES

● You'll find this King Vertical Boring and Turning Machine in one of our Navy Yards working one, two and even three shifts making repair and replacement parts for our battle fleet—keeping them "fit" for combat.

This particular King Boring Mill is equipped with two swivel heads on the crossrail and electric push button control on pendent to facilitate operation and speed up production.

The bed cast in one piece with double wall with connecting ribs—the housings of box construction—the cross brace of rectangular box section construction rigidly bolted between housings, provide rigidity required to maintain original alignment.

This sturdy, well balanced construction assures accuracy of production, and inherent strength permitting high speeds and heavy feeds for increased output.

For your vertical boring, turning, reaming, facing and similar operations use a King Vertical Boring and Turning Machine—for maintaining accuracy —saving time—reducing costs.

KING BUILDS

Vertical Boring and Turning Machines in single column types from 30" to 42" and double column up to 10 feet.

The KING MACHINE TOOL Company

BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY

CINCINNATI, OHIO

WHO COUNTS THE COSTS of *Keeping 'Em Rolling?*

• The war-time achievement of the American railroads has astonished the entire nation. The operating officials did not have to worry about costs because twenty years of courageous preparation made it possible for them to provide the most economical transportation for our country at war.

They have accomplished the task with 20,000 fewer locomotives—a half a million fewer freight cars and approximately a hundred fewer locomotive shops than they had in 1918.

How? Because twenty years of planned progress found them with the best power—best cars—best tracks and best equipped shops in the world.

BULLARD Vertical Turret Lathes have played a big part in helping the railroads to "Keep 'em rolling" for a minimum cost. They will be found in practically every large locomotive shop handling 75% of all boring and turning jobs in 50% less time than the ordinary mills.

ARMY E NAVY

BULLARD

THE BULLARD COMPANY

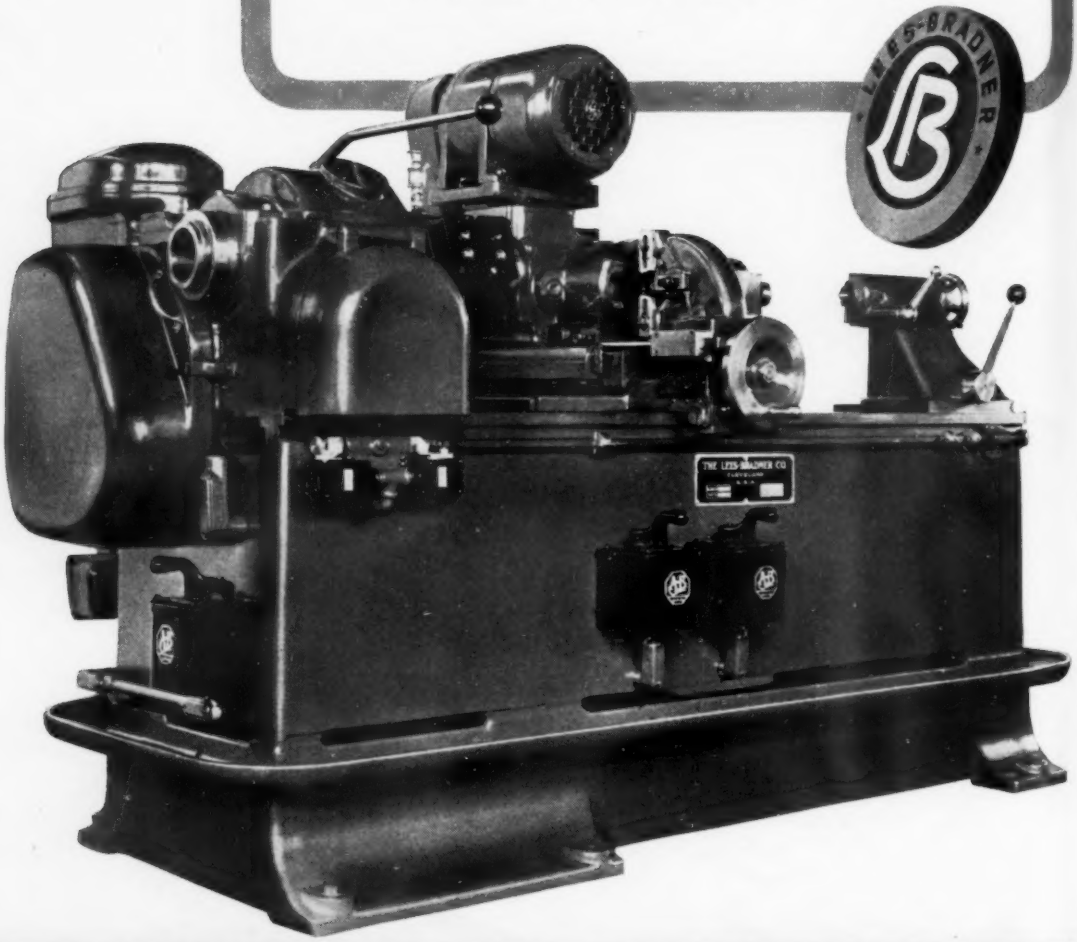
BRIDGEPORT, CONNECTICUT

LEES-BRADNER
LIGHT TYPE
THREAD MILLER

● In hundreds of plants producing airplane parts Lees-Bradner LT Model Thread Millers have gained wide acceptance for their speed and close tolerance thread generation.

For internal or external threading—for either disc or hob type threading—on work up to six inches maximum diameter—you can't go wrong with a Lees-Bradner LT Thread Miller.

Consult our Engineers for specific information on your precision threading.



The LEES-BRADNER Company
CLEVELAND, OHIO, U.S.A.

SPARKS SEMI-AUTOMATIC HYDRA-FEED CHUCKING LATHE

set up for ROUGH and FINISH TURNING NOSE and CONTOUR of 75 m/m S.A.P. SHOT BODY

While actual figures are not permissible, this set-up resulted in a production increase over previous methods which proved the worth of the SPARKS design by a wide margin.

The almost unlimited tooling possibilities of the SPARKS, making it adaptable to the urgent needs of war production, also offer outstanding possibilities for economical handling of a wide range of work in the years to come.

TOOLING FOR SHOT BODY OPERATIONS

A single carriage is provided that carries individual front and rear cross slides that are individually operated by hydraulic cylinders operating in timed relation to each other. A rear tool rough turns the nose contour by individual cam arrangements. Cam track is carried in rear cross slide and acts upon the tool slide during the longitudinal movement of the carriage.

Front tools rough and finish turn the same nose contour by a similar arrangement.

With slightly different tooling, this machine is adaptable also to performing these same operations on 90 m/m shot bodies.

MODERN FEATURES FOR FAST WORK

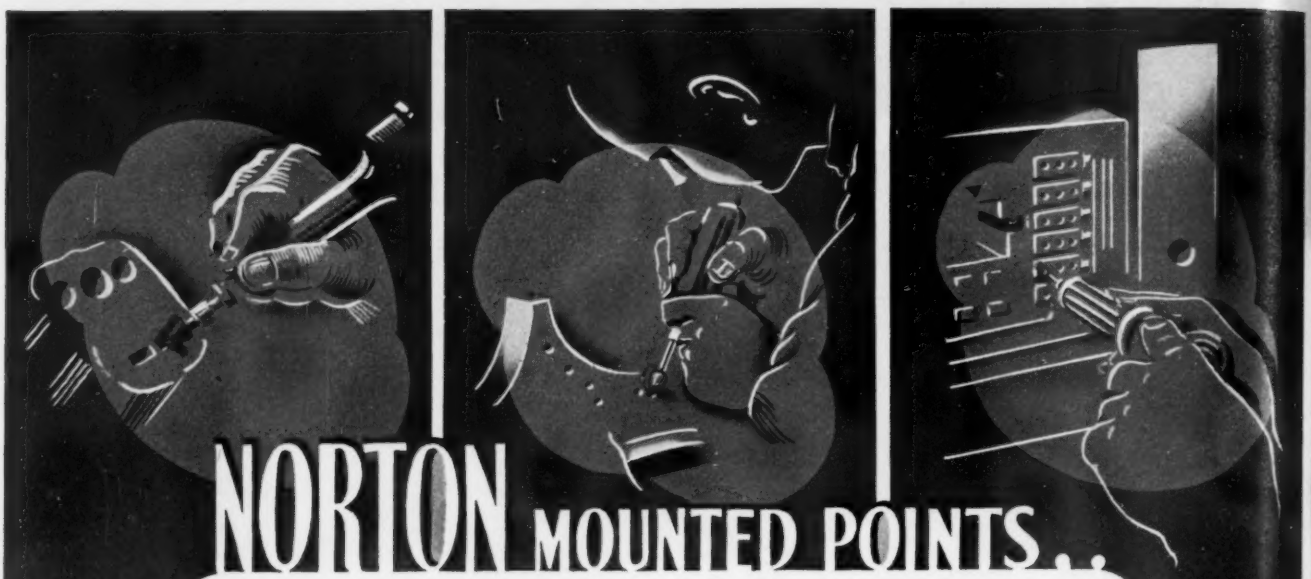
Conveniently located metering valves control feed movements, while other valves, automatically actuated, cut in rapid transverse motion for non-cutting movements, thereby reducing non-productive time to a minimum. A manual valve on hydraulic control panel operates collet jaws for speedy loading and recovery of work.

Headstock is amply proportioned, equipped throughout with ball and roller bearings and provides four selective speeds to meet a wide range of requirements.

Ask SPARKS for assistance in meeting your production problem

SPARKS HYDRA-FEED LATHE

SPARKS MACHINE TOOL CORPORATION
NORWALK . . . . CONN.



NORTON MOUNTED POINTS..

Little Things that can be a Big Help

THERE are literally hundreds upon hundreds of war jobs on which these Norton spindle mounted grinding wheels can be a big help. Not only in the tool room for making molds and dies but on countless production jobs they provide the quickest and easiest way to remove metal. In air or electrically operated grinders they can be used by hand or mounted in lathes, millers, and other types of machines.

There's a Norton catalog that shows the complete line of sizes and shapes. Write today—asking for Form 43-AM.

NORTON COMPANY, WORCESTER, MASS.

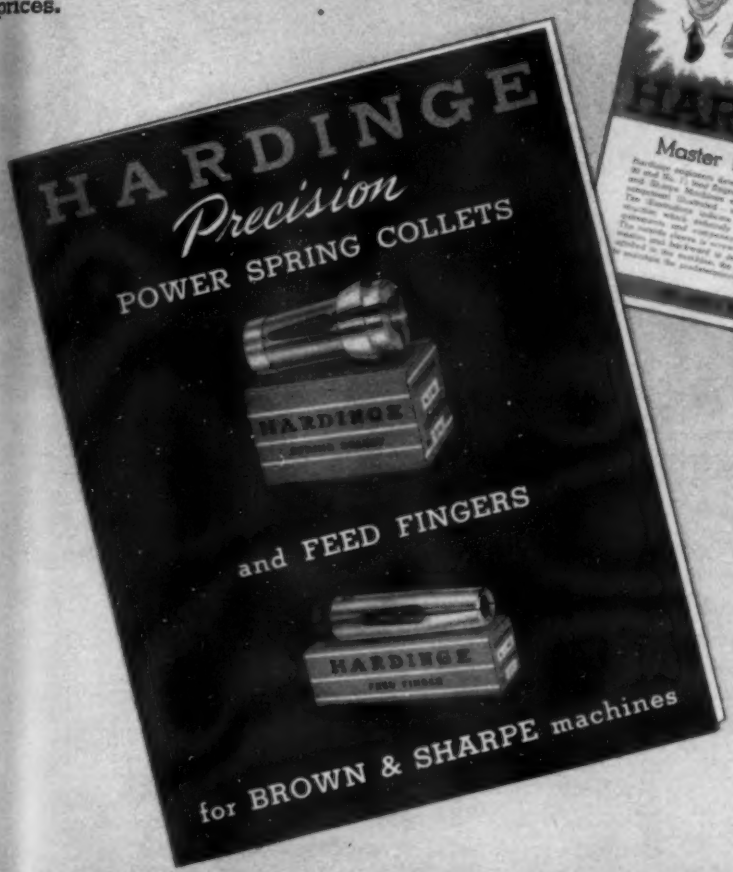
and MOUNTED WHEELS

Nearly 200 Standard Sizes and Shapes

NORTON ABRASIVES

New HARDINGE bulletins available to users of Brown & Sharpe machines

The inside pages of this bulletin give helpful information for ready identification of Brown & Sharpe style collets and feed fingers. It clearly presents customary use of each style and lists attractive prices.



QUESTION:
When feeding steel bars, aluminum bars, or tubing— 3 different tensions are required.
How can you do this with ONE Feed Finger?
ANSWER:
HARDINGE
Master Feed Fingers with Adjustable Tension

Describes the advantages of HARDINGE Master Feed Fingers with adjustable tension for No. 00 and No. 0 Brown & Sharpe machines.

Address your inquiry for these free bulletins to HARDINGE BROTHERS, INC., ELMIRA, N. Y.

HARDINGE
ELMIRA, N.Y.

How Carpenter has Increased the Usefulness of Another Metal

Just as you have been able to use Stainless Steel to greater advantage since 1928 when Carpenter invented Free-Machining Stainless—you can now take full advantage of the properties of INVAR, as a result of this timely new development.

Invar, a 36% nickel alloy that expands only a tenth as much as carbon steel when subject to temperatures up to 400° F., used to be as tough to machine as straight 18-8 Stainless Steel. *Invar* was so tough to machine that engineers often gave up the idea of using it, even when they needed the metal's low expansion properties.

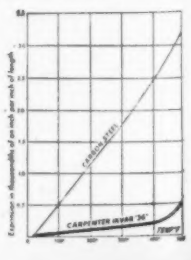
So Carpenter research went to work, and now we announce an *Invar* that is actually easy to machine . . . *Carpenter Free-Cut Invar "36"*. Through the addition of selenium to the alloy, its cutting qualities have been improved, while its low expansion properties remain exactly the same.

Invar (in the form of strip) is being used in making parts for aircraft controls, thermostats, special radio parts and other devices that must remain accurate even where temperatures vary. But now that bars of *Invar* can be easily machined, this unusual metal will be able to take over new jobs. Designers will be able to adopt it without fear of their recommendations being called "impossible" by production men.

The story of *Invar* production research is told on the next page. If, after reading it, you would like more information about *Invar* and its properties, get in touch with our Metallurgical Department. Or, ask for our latest bulletin.

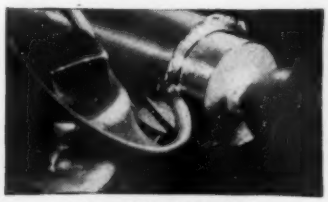
Exactly What IS Carpenter Invar "36"?

Carpenter Invar "36" is a 36% nickel alloy adapted to use in any parts which must not change in size through temperature ranges up to 400° F. A typical expansion curve is shown in the accompanying graph, comparing the thermal expansion of *Carpenter Invar "36"* with that of carbon steel. Extremely close control of analysis in melting within a carefully determined range assures uniformity from lot to lot, so that no selection for special applications is necessary. *Carpenter Invar "36"* is available in the forms of hot rolled and cold drawn bars, cold rolled strip, wire, and welded tubing. *Carpenter Free-Cut Invar "36"* is available only in hot rolled and cold drawn bars, for applications where free-machining properties are required.



Tests Made To Determine Machinability of Carpenter Free-Cut Invar "36"...

The comparative tests described below were made in order to provide data on the relative machining properties of the regular grade of *Invar* and *Carpenter Free-Cut Invar "36"*. In each case, standard high speed cutting tools, ground with standard angles, were used.



Roughing Cut of Regular Grade *Invar*.

Roughing Cut of Free-Machining *Invar*.

ROUGHING CUT—1" round bars cut with high speed tools on a standard lathe; feed .0055" and cut 3/32".

COMPARATIVE ROUGH MACHINING TESTS
(Also see photographs)

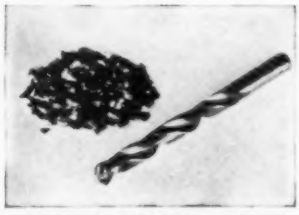
REGULAR GRADE INVAR		Carpenter FREE-CUT INVAR "36"	
Speed surf. ft./min.	Results	Speed surf. ft./min.	Results
28.80	Satisfactory		
49.22	Tool failed after cutting 1" along bar		
82.47	Tool failed after only a few revolutions	82.47	Excellent
		137.45	Excellent, with no evidence of tool failure
		137.45 was top speed for lathe used, so feed was increased from .0055" to .0125" — with results still excellent.	

FINISHING CUT—Same bars used (diameters: .8125") with feeds at .0055" and cuts of .050".

Finishing tests were made to determine the highest speeds for the best possible finishes. Indications were that 23.40 surface feet per minute provided the best finish on the bar of regular *Invar*, whereas a good finish on the *free-machining* grade was produced at 111.67 surface feet per minute. At this speed, and with feed increased from .0055" to .0125", the free-machining grade still provided a good finish.

COMPARATIVE DRILLING TESTS

Tool used and chips produced in drilling regular grade *Invar*.



Tool used and chips produced in drilling free-machining *Invar*.

DRILLING—Standard drill press with automatic feed and 7/16" round high speed drills used on test blocks 2 3/16" thick. Feed: .004" per revolution; Spindle Speed: 665 R.P.M.

The drill used on the test block of regular *Invar* failed completely after penetrating to a depth of only 1 1/16" (see photo). An identical drill used on the block of free-machining *Invar* drilled through the 2 3/16" block without difficulty, and was in good condition at the end of the test (see photo). Note the difference in the chips produced by each of these drilling operations. They provide further evidence of the machining qualities of *Carpenter Free-Cut Invar "36"*.

MACHINED TEST BARS

Test bar of regular grade *Invar*.

Test bar of free-machining *Invar*.

Comparison of these unretouched photos shows the excellent machining qualities of *Carpenter Free-Cut Invar "36"*. The finished threads, made at 60 R.P.M., on the bar to the left are rough and torn. The threads on the free-machining bar, to the right, were made at 188 R.P.M. and have a considerably better finish. And the glazed surface on the bar of regular *Invar* indicates a "tearing" rather than smooth-cutting action. Note on the bar of regular *Invar* the burred edges around the drilled hole, and the rough edges where the roughing cut stopped.

If you would like more information about Carpenter Free-Cut Invar "36" and its properties, ask for our latest engineering bulletin.

Just as Carpenter laboratories are working to develop better, more usable metals . . . your nearby Carpenter representative is helping designers, fabricators and tool engineers to get the most from every pound of metal they use. He is providing useful information to speed the fabrication of Stainless Steel parts—and can help you simplify the selection and heat treatment of Tool Steel for each job. Take advantage of his diversified experience with problems involving these metals. Get in touch with him today.

The Carpenter Steel Company • 109 Bern Street, Reading, Pa.

Carpenter { High Nickel Alloys
Stainless Steels
Matched Tool Steels

BRANCH WAREHOUSES AT—CHICAGO · CLEVELAND · DETROIT · HARTFORD · ST. LOUIS · INDIANAPOLIS · PHILADELPHIA

More Tools
FOR MORE MACHINES OF WAR
from THOMPSON GRINDERS

★ Here is a typical example of the way Thompson Grinders are helping hundreds of manufacturers of machine tools and war materials maintain rigid tolerances and equally stringent production schedules.

The "C" type Thompson Grinder shown is grinding Tool Holder Arms for a well known Crankshaft Lathe Co. The material is 6145 steel. Surface ground is 18″ x 42″ and from .010″ to .015″ stock is removed from each side and tolerances of .005″ maintained at a highly satisfactory production rate.

The hydraulic drive to both the table and wheel head insures smooth shockless operation resulting in smoother, more accurate work and maximum production.

For your flat surface grinding it will pay you to become thoroughly familiar with the many advantages of Thompson Grinders. Ask for bulletin.

Thompson Grinders are built in several types and sizes. Highest capacity Type C 36″x36″x220″.

THE Thompson GRINDER CO.

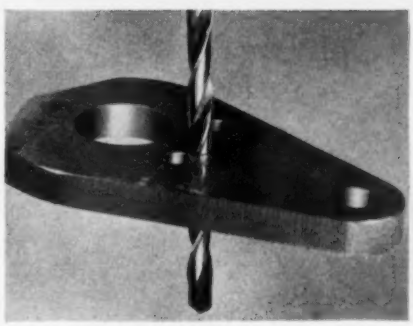
SPRINGFIELD, OHIO

Rx for War Contracts

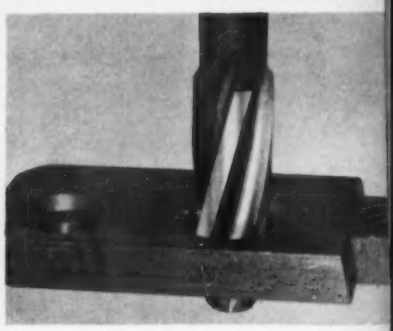
• The No. 2 Footburt Sipp with back gear unit is a full range sensitive drilling machine with correct speeds for all types of war work. It is the prescription for faster, more accurate drilling.

All eight speeds are obtained on belt drive machines or on motor drive machines with standard single speed motor—no special motors are needed. The simple design provides wide speed range at the lowest cost.

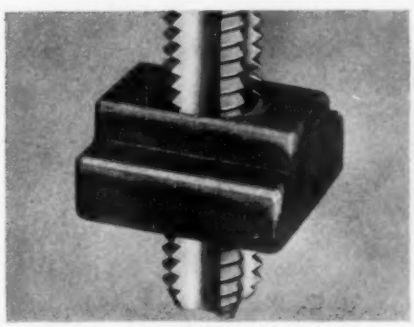
THE FOOTE-BURT COMPANY
CLEVELAND, OHIO
Detroit Office: General Motors Building



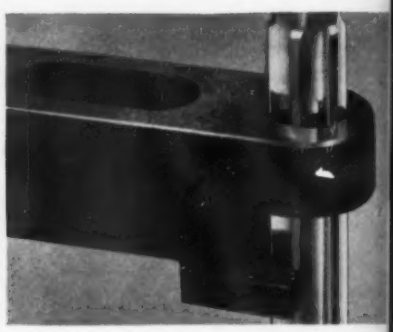
DRILLING



COUNTERBORING



TAPPING



REAMING

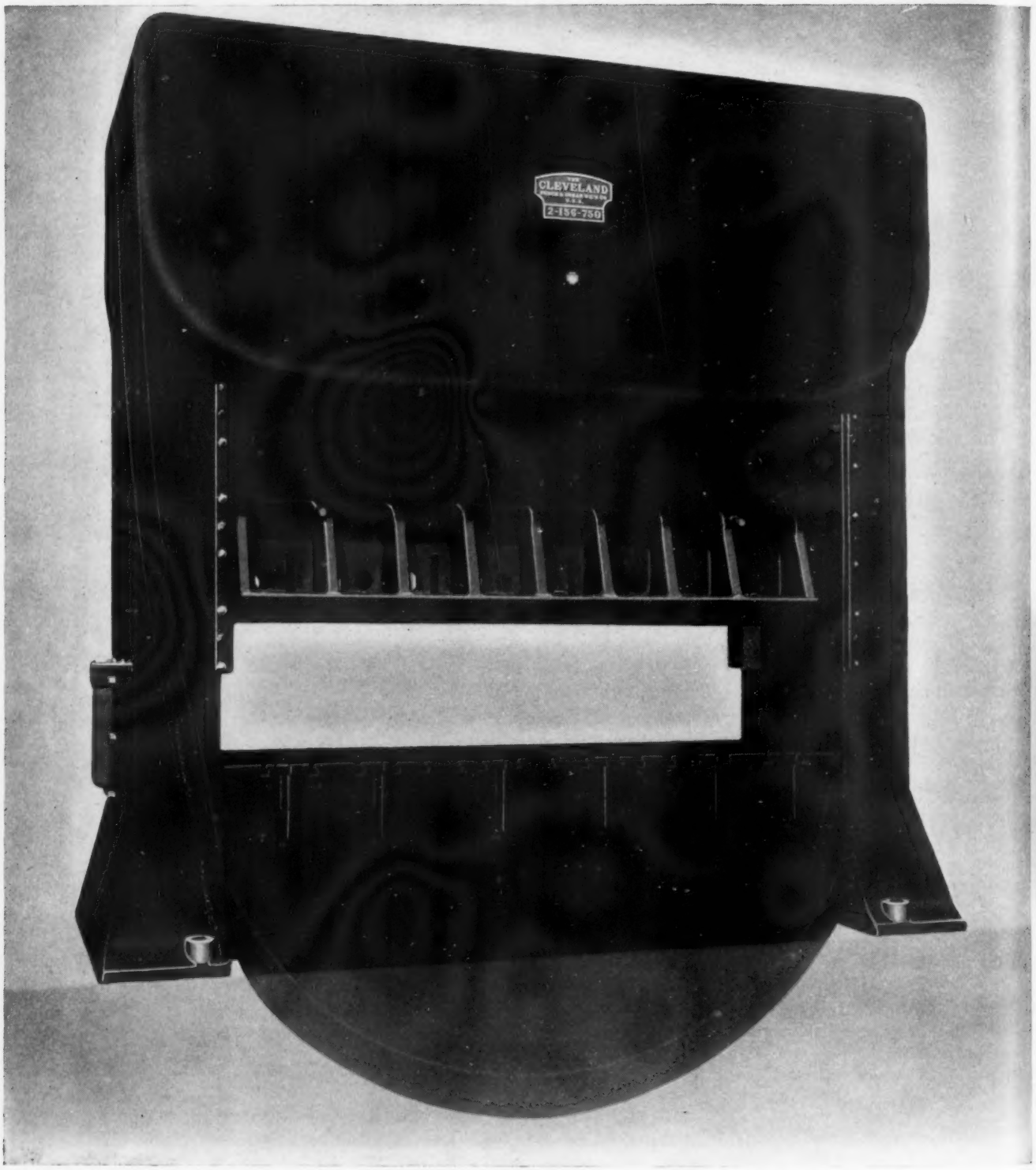
No. 2 MACHINE WITH BACK GEAR

8″ or 12″ Overhang • 5/8″ Drilling Capacity in Steel • Optional Speed Ranges • 185 to 2300 R.P.M. • 280 to 3450 R.P.M. • Vertical Motor Drive with Standard Single Speed Motor • Power Feed Assembly • Tapping Attachment • Coolant Outfit.

FOOTBURT *Sensitive* DRILLING MACHINES

Modern Presses

SINGLE POINT · **TWO POINT** · FOUR POINT

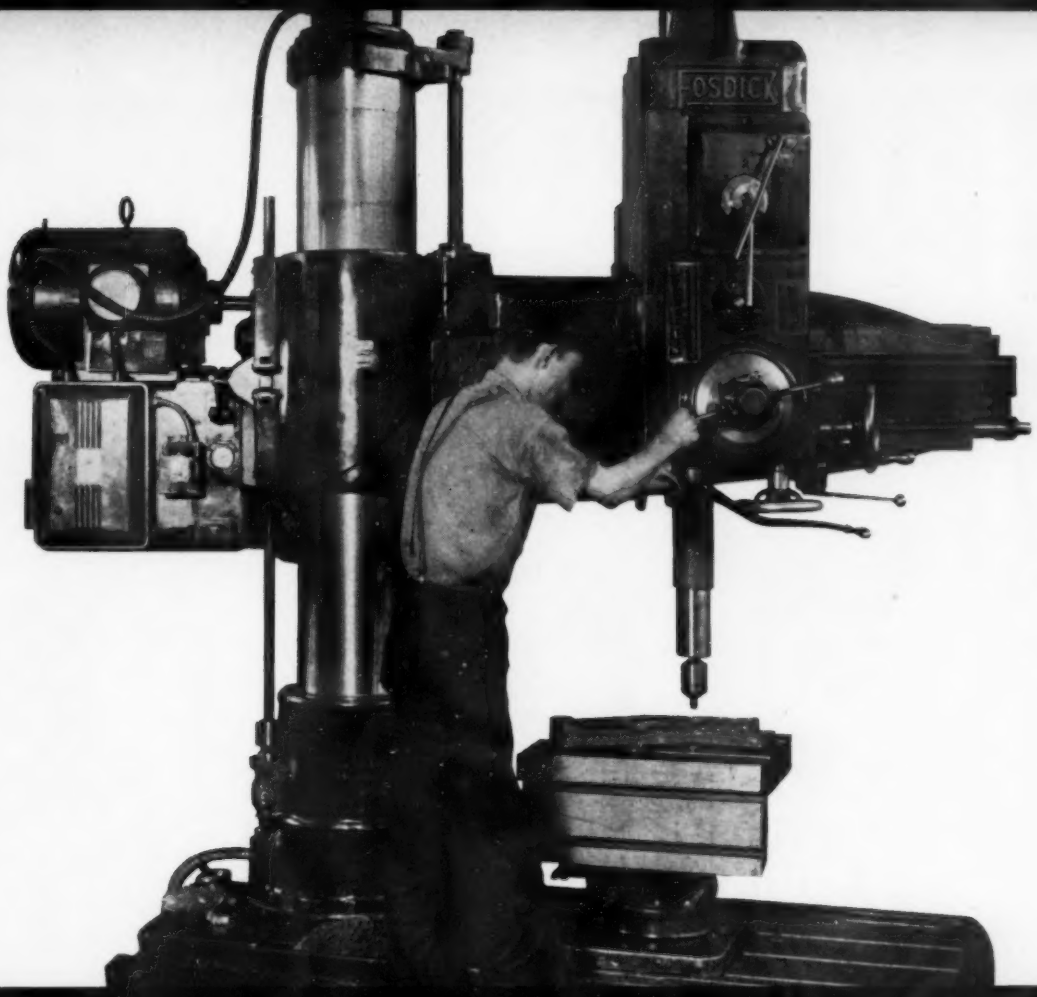


Modern Cleveland Single Point, Two Point and Four Point Presses are now being used by many leading Aeroplane Manufacturers, not only because of the speed with which duplicate parts can be produced but also because they offer many other advantages such as: low initial cost, economical use of floor space, unusual accuracy, dependability, minimum upkeep and the very short period of time required to train employees to become efficient operators.

The Press illustrated is a Two Point which has a bed area 52" x 156", a capacity of 750 tons and is equipped with an electrically controlled air operated friction clutch and brake.

THE CLEVELAND PUNCH & SHEAR WORKS COMPANY

Cleveland, Ohio



MORE AUTOMATIC SCREW MACHINES FOR *"All Out"* PRODUCTION

FOSDICK *Hydraulic* RADIALS

As we broaden our fighting fronts around the globe, ammunition, small arms, cannon and mechanical equipment becomes more vital than ever.

Here a Fosdick Radial is drilling and reaming steel castings used in making Automatic Screw Machines to help produce more of these vital materials—faster.

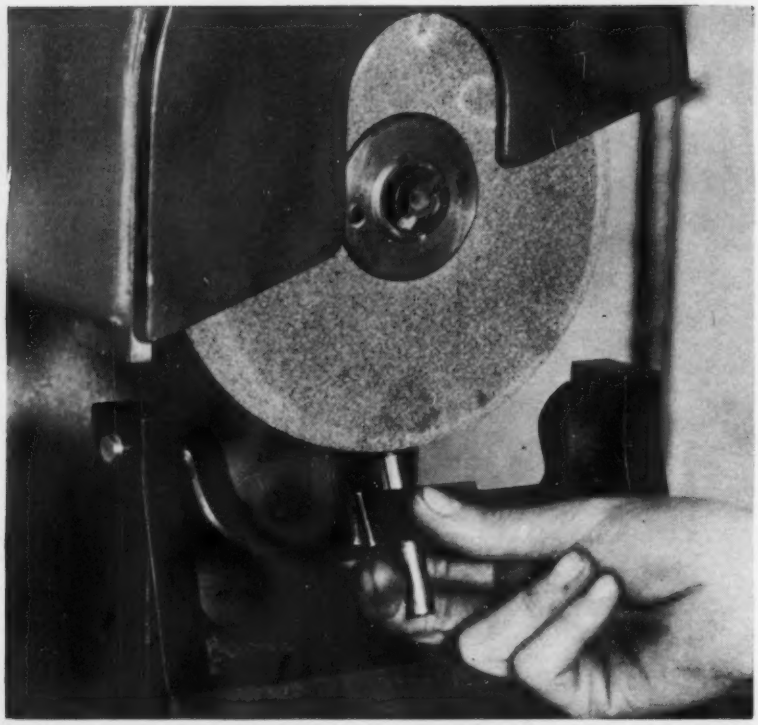
The wide range of feeds and speeds — all controls conveniently located on the head—the full hydraulic circuit for manipulating controls are features that make for ease of operation and versatility.

No matter what your drilling, reaming, facing, tapping or boring operation may be, if it can be done on a Radial you can do it easier, better and at less cost on a Fosdick.

For full details of construction and operation ask for Fosdick Radial Bulletin R. A.

ARMY E NAVY

FOSDICK MACHINE TOOL COMPANY
CINCINNATI · · · OHIO



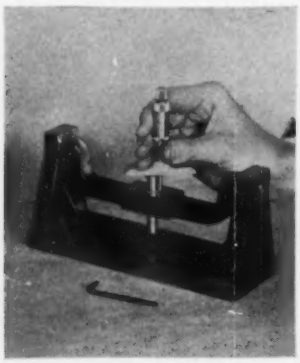
DRESS YOUR GRINDING WHEELS

quickly and accurately—save time and improve quality of work with the

"LITTLE WONDER" RADIUS DRESSER

This inexpensive tool can be of outstanding utility in any grinding room as a practical and fast means of keeping grinding wheels in prime condition for radius grinding jobs.

Operation is extremely simple. To obtain the desired radius, the diamond tool is set a certain height from bottom or top of the ground flat on swinging arm. A depth gage, gage block or micrometer may be used for setting.



Using a depth gage to set "LITTLE WONDER" RADIUS DRESSER.

The "Little Wonder" Radius Dresser is a time saving tool for dressing radii from 0-1" either convex or concave. It is practically a necessity for grinding forming tools, fillets, templets and for grinding rake angles on collapsible tap chasers as well as in the manufacture of end cutting and other tools.

The "LITTLE WONDER" RADIUS DRESSER is fully guaranteed and can be depended on for accuracy and long service life.

Investigate Scherr Grinding Room specialties by sending for complete information.

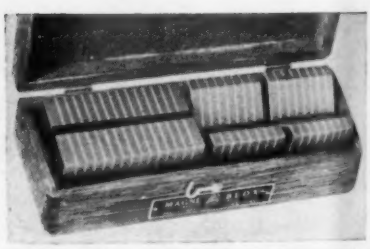
GEORGE SCHERR CO., INC.

124 LAFAYETTE ST., NEW YORK, N. Y.

SCHERR MACHINISTS' TOOL SPECIALTIES

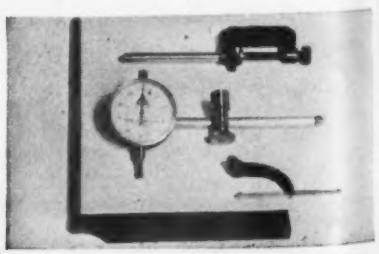
MACHINISTS TOOLS in a wide range of types for precision measuring of all kinds.

TOOL CHESTS with separate locks for open top and drawer section. Light weight but strong and durable.

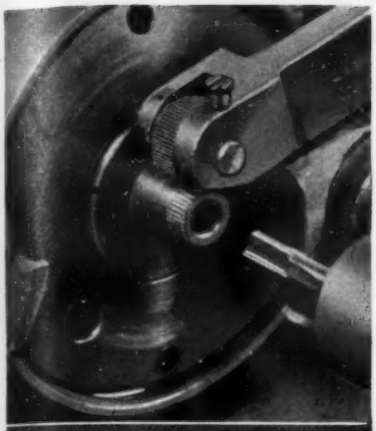


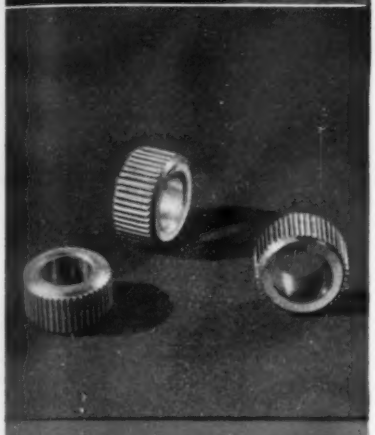
MAGNE-BLOX laminated magnetic parallels and V blocks are designed especially for holding work that cannot be placed directly on magnetic chuck. Inexpensive and practical.

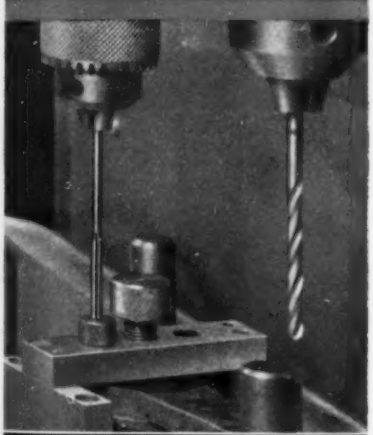
REED MICROMETERS—accurate, long-lived, easy reading and sensitive. Made in several types.

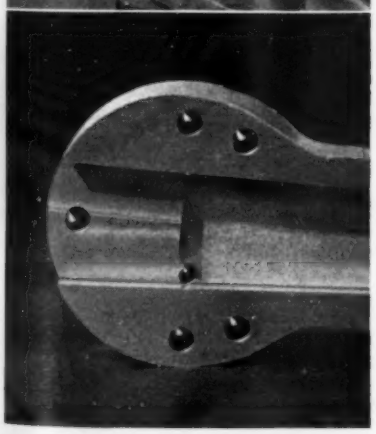


DIAL INDICATORS—fully guaranteed for accuracy. Available with attachments for various uses.









REAM BETTER HOLES

from .050" to .500"

with

BARBER-COLMAN

Ground-from-Solid

REAMERS

THESE solid fluted reamers will provide maximum accuracy in the range from .050″ to .500″. Cutting diameters are guaranteed within + .0002″/— .0000″, but many will run even closer than that. In each case, the individual reamer is engineered for the job it is to do, thus assuring maximum cutting ability and longer life. B-C Ground-from-Solid Reamers are made from hardened blanks, centerless ground to specified cutting diameter, and then fluted from the solid. This method avoids all hardening distortion and provides these advantages: • There is no possibility of inferior, minutely dubbed cutting edges which may result when teeth are cylindrically ground after fluting. • The diameter is accurately established within tenths before the flutes are ground, making it unnecessary to measure across the flutes. • Smoother finish results on the cylindrical cutting land. There is no intermittent grinding as when reamers are fluted and then cylindrically ground to size. ★ *If you have fine precision work such as aircraft parts, guns, instruments, or small textile machinery parts requiring reamed holes, send us your prints for quotations and recommendations.* At present we have facilities available for delivery in approximately 8 weeks depending on priority rating available.

The photographs in the panel above show B-C Ground-from-Solid Reamers in operation and the finished parts. • The upper views show an aircraft part of nitralloy steel requiring a .2508″/.2510″ hole with fine finish. • The lower views show a textile machinery part requiring holes .1880″/.1885″ in cast iron.

Buy War Bonds

BARBER B-C COLMAN PRODUCTS

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

Barber-Colman Company

GENERAL OFFICES AND PLANT • 201 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

GE Electronics REVOLUTIONIZES VARIABLE-

New G-E THY-MO-TROL Drive Gives You Full-range, Stepless Speed Control

● *D-C ADVANTAGES FROM A-C POWER*

Complete Drive — Nothing Else to Buy. Thy-mo-trol drive is a complete equipment operating its d-c motor from your a-c power line. Starts, accelerates, controls speed, stops by dynamic braking, and reverses the motor—all from a single, compact, control station. And it fully protects the motor.

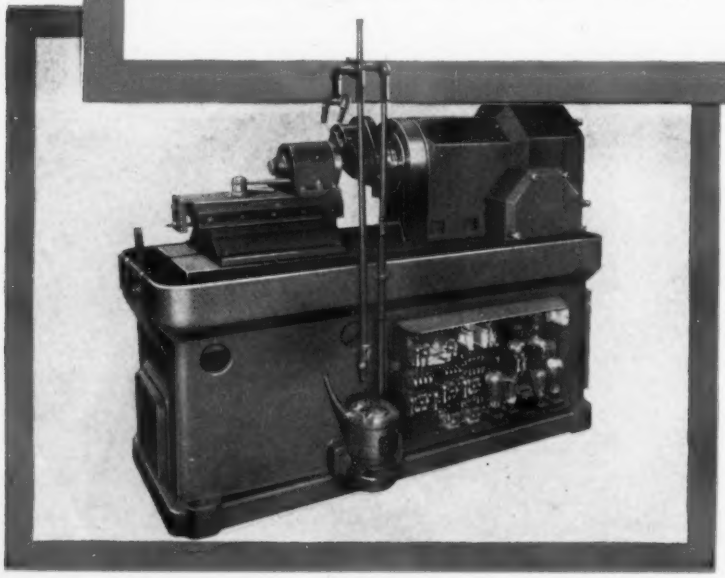
Makes available previously unused advantages of d-c motors, such as:

1. Full-range, Stepless Speed Control. A single dial—small as a radio volume control, and mounted in the push-button control station—gives complete adjustment of motor speed, from zero to maximum, *without steps*. No belts, gears, or clutches needed to change speed. Gives you the exact speed you want, whether it be for roughing or fine finishing.

2. Holds Speed under Changing Load. Regardless of load fluctuations—if they're within the power range of the drive—Thy-mo-trol electronic circuits hold speed constant within extremely narrow limits. With Thy-mo-trol drive you get both full speed-range and a flat speed-load characteristic.

3. Full Torque at Low Speeds. Though the motor may be scarcely turning over, it will deliver *full torque* right up to the stall point! That means greater output than with other drives. And the motor is fully protected at all times.

4. Current-limit Acceleration. Regardless of the speed-control setting when the START button is pushed, Thy-mo-trol acceleration is smooth because of electronic current limiting. Yet you get fastest possible starting because of sustained maximum torque during acceleration. No shock to your machine due to sudden



Already — Operating Results!

Thy-mo-trol drive—built into this planetary milling machine made by Plan-O-Mill Corporation—provides automatic cyclic control of feed-in, feed-around, and rapid reverse, each at a different preset speed. Plan-O-Mill engineers selected Thy-mo-trol drive for its compactness, stepless speed control, low cost, and simplicity. They have found that tool life is greatly lengthened by using correct speeds for each operation, and by being able to start the tool at low speed with full torque.

SPEED DRIVE!

FULL CONTROL with a SINGLE DIAL

application of excessive torque. No current peaks on the line.

Dozens of Other Thy-mo-trol Extras . . . such as: low maintenance (by elimination of moving parts); speed can be preset before starting; saves space; no stop for speed change; easy to control automatically; operates direct from a-c line—no motor-generator or other special d-c supply needed.

Where Has It Been Applied? Drill presses, to increase speed range and size of work handled. Grinders, for precise speed selection and improved finish. Milling machines, to increase range of work handled, and to simplify design. Propeller testing, for accurate, smooth speed control. Cable reelers, to maintain constant tension. Conveyors, to match speeds.

How to Buy Thy-mo-trol Drive. Because *electronic* motor control offers so many advantages through improved machine design, performance, and operating technique, G-E engineers want to consider each of *your* problems as an individual case. Standard Thy-mo-trol drives can be obtained in sizes up to 10 hp. Special types can also be provided. For further information write, stating your problem, to any G-E office, or to Electronic Control Section, General Electric, Schenectady, N. Y.

Another FIRST in Industrial Electronics by

GENERAL ELECTRIC

570-109-P060

CINCINNATI Hypro

36" DOUBLE HOUSING *Planer*

Hypro means Hyproduction so necessary to reduce costs. All machines of the Cincinnati Hypro line are the latest design including exclusive Cincinnati Hypro features. Descriptive bulletin 135 tells the story.

THE CINCINNATI PLANER COMPANY

Planers . Vertical Boring Mills...Planer Type Millers

CINCINNATI . OHIO . U.S.A.

UNION

FOR ACCURACY THAT LASTS ON TOUGH WARTIME JOBS!

In today's war production, accuracy is doubly important, and the LONG-LASTING ACCURACY of Union Tools is helping to make wartime jobs economical as well as efficient. In these days of tool shortages, priorities and scarcity of labor it is important not to waste tools, materials or time.

Buy Union Tools. You'll find that with proper care they'll give you longer accurate service that means real tool economy.

The Tools You Buy Again!

UNION TWIST DRILL CO.
ATHOL, MASS.

S. W. Card Mfg. Co. Div., Mansfield, Mass.
Butterfield Div., Derby Line, Vt.
Butterfield Div., Rock Island, Quebec.

STORES

New York: 61 Reade St.
Chicago: 11 So. Clinton St.
Detroit: 6540 Antoine St.
San Francisco: 121 Second St.
Los Angeles: 524 E. Fourth St.
Seattle: 568 First Ave., South

Divisions of the UNION TWIST DRILL CO.

UNION BUTTERFIELD CARD

Butterfield

"THRED-RITE" DIES

The adjustable collet die at its best! The result of Butterfield's intensive research into ways to improve the tools of modern production. "THRED-RITE" Dies are simple in construction, easy to assemble and quickly adjustable to split 0.001". Full floating construction assures accurately centered work. Where speed is imperative—and the going tough—put "THRED-RITE" Dies on the job!

Divisions of the

UNION TWIST DRILL CO.

BUTTERFIELD DIVISION

DERBY LINE, VT. **ROCK ISLAND, QUE.**

STORES: New York, 61 Reade St. Chicago, 11 So. Clinton St. Cleveland, Hal. W. Reynolds, 3346 Superior Ave. Detroit, 6540 Antoine St. Los Angeles, 524 E. Fourth St. Toronto, 208 King St., West. Montreal, 111 St. Paul St., West. Winnipeg, 403 Travellers Bldg. Vancouver, 327 Shelly Bldg. Agents for Great Britain—Charles Churchill & Co., Ltd., 27-34 Walnut Tree Walk, Kennington, London, S. E. 11, England. Branches at Birmingham, Manchester, Glasgow, Newcastle-on-Tyne and Bristol.

UNION BUTTERFIELD CARD

QUALITY CARD TAPS

FOR EFFICIENT WARTIME SERVICE

The Card Emblem has always been a reliable guide to efficient tools for producing accurate threads, and present war production demands find Card ready with tools to do today's vital tapping jobs. In plants engaged in top-speed war production, ***results*** are proving the wisdom of using the Card Emblem as a guide to real tap service!

S. W. CARD MFG. CO.
MANSFIELD, MASS.

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New York: 61 Reade St.
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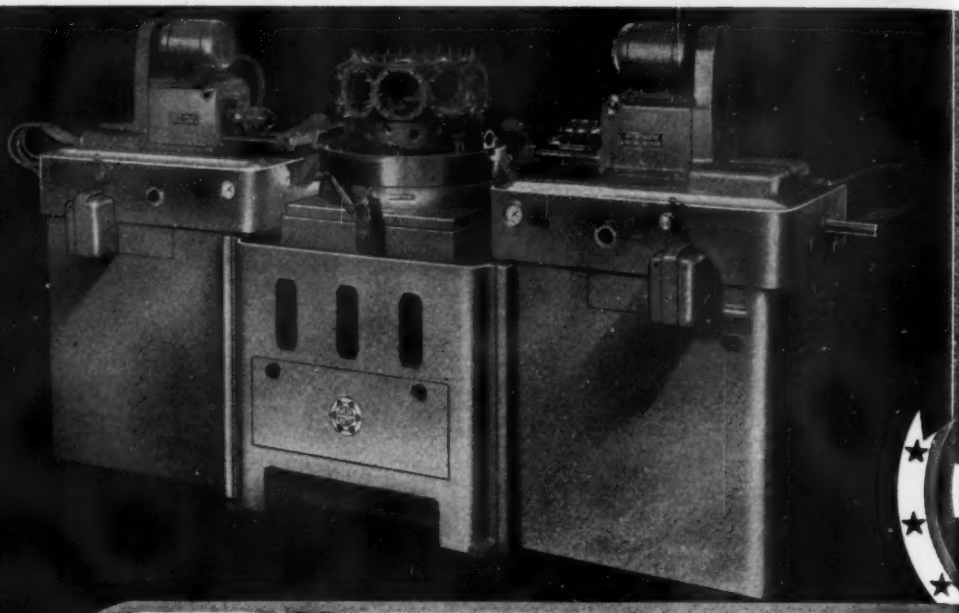
Seattle: 568 First Ave., South

Divisions of the
UNION TWIST DRILL CO.

UNION BUTTERFIELD CARD



Honing valve guides after assembly in crankcase (Radial Aircraft Engine) on Double End Hydrohoner with Micr-O-Size control—production 3 to 6 complete assemblies per hour—removes average of .0005" to .001" stock per bore—generates uniform size within .0003" to .0005", accuracy within .0001" to .0003" and surface finish within 3 to 5 micro-inches, r.m.s.

AIRCRAFT···—

FOR VICTORY PRODUCTION

SAVE TIME
★
SAVE METAL
★
SAVE COST
★
IMPROVE QUALITY

AIRCRAFT···—

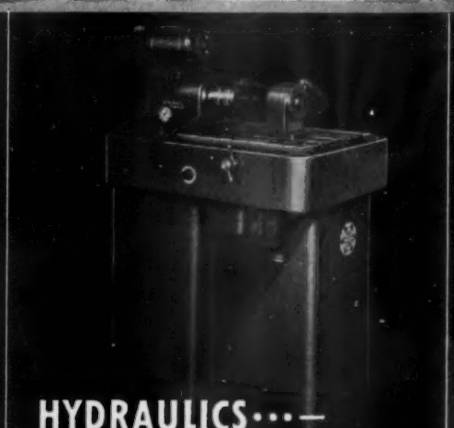
Feathering Oil Pump Gear Teeth (Aircraft Engine) external honing.

AIRCRAFT···—

Honing Piston Pin Bores (Aircraft Engine).

AIRCRAFT···—

Honing Valve Guides (Aircraft Engine) before assembly.



HYDRAULICS···—

Honing O.D. of pistons for a variable delivery pump.

Honing cast iron valve guides on full automatic Hydrohoner with Micr-O-Size control—Production 250 pieces per hour. Average Stock removed, .0015" to .0025"—Size within .0005" tolerance; accuracy within .0001" to .0002"; surface finish within 3 to 5 microinches, r.m.s.

Honing Piston Pin holes (in Piston) on Double Spindle Hydrohoner with Micr-O-Size control.

AUTOMOTIVE···—

Microhoning has been adopted in most armament production shops to speed up the final processing operation on vital bearing surfaces.

Microhoning generates final surfaces with the minimum amount of stock removal.

Microhoning saves sufficient processing time and cost in some installations, it is reported—even *to pay for the machine in 30 to 40 operating days.*

Microhoning controls cutting pressure, speed and motion to produce maximum obtainable quality of generated surfaces.

Write for Bulletins AR60 and AR64 for further details.

MICROMATIC HONE CORPORATION

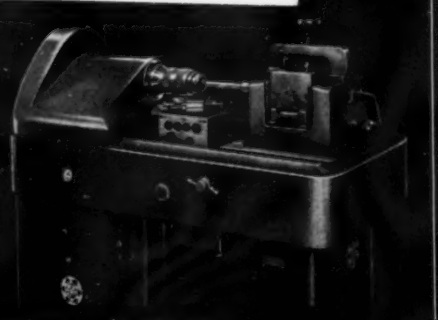
1345 E. MILWAUKEE AVE. DETROIT, MICHIGAN

ORDNANCE···—

Double Spindle Hydrohoner with Micr-O-Size control for honing gun charger tube bores.

HYDRAULICS···—

Honing blind end bores in a variable delivery pump body.



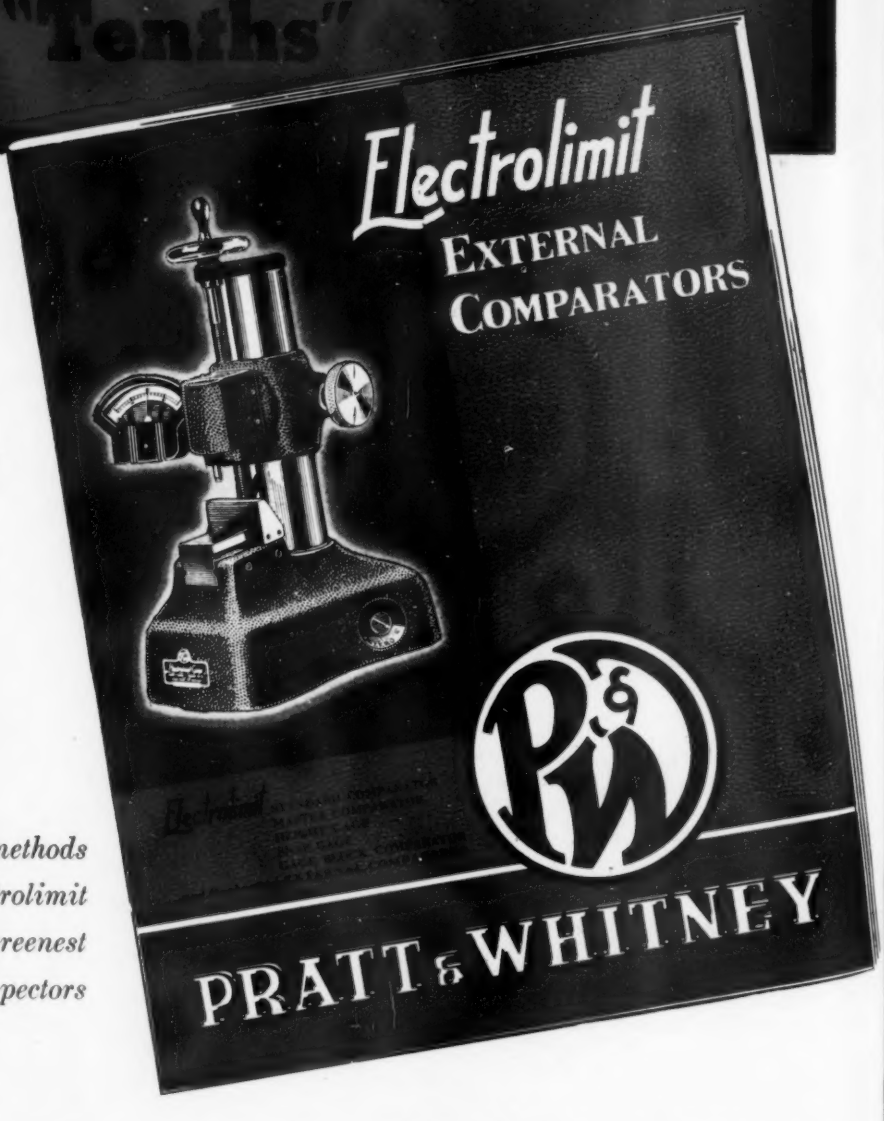
HYDRAULICS···—

Honing bores in hydraulic valve body on Micromatic Hydrohoner.

ORDNANCE···—

Honing pinion shaft bores in hardened planetary gear for military vehicle.

Even *Green* Operators can Inspect *Rapidly* ...to "Tenths"



This New Bulletin Tells How

Accurate, high-speed gaging methods made possible by P&W Electrolimit Comparators actually turn the greenest operators into competent inspectors almost overnight.

If P&W Comparators did no more than that, they'd still be valuable additions to the equipment of any precision metalworking plant today. But they do *far* more: they eliminate "feel," pass okay parts that might be rejected by less positive methods, check parts *at the machine* with laboratory accuracy.

INVESTIGATE the speed-up possibilities of Pratt & Whitney Electrolimit Comparators — this new bulletin tells all.

COMPANY EXECUTIVES: Your free copy will be sent promptly if you'll request it on your company letterhead.

PRATT & WHITNEY
Division Niles-Bement-Pond Company
WEST HARTFORD • CONNECTICUT

Let Us Show your Green Hands

HOW TO GET MAXIMUM VALUE OUT OF ABRASIVES

One of the moral obligations any manufacturer assumes when he places his product on the market is the task of seeing to it that users of that product get the utmost value out of that use.

That is true of *any* manufacturer and *any* product at *any* time. It is particularly true in America today when American industry, attaining greater and greater production standards, is operating with a considerable number of comparatively untrained, unskilled hands.

The very fact that American industry, despite that handicap, is setting production records for the world to gape at is a tribute to the efficiency and ingenuity of American machine tool designers, the genius of American industrial leaders and the intelligence of American workers. But all that doesn't whittle one particle from the responsibility of those who supply the tools with which those records are made.

The MID-WEST ABRASIVE COMPANY, now as always, is eager to help you get the last ounce of value out of any MID-WEST abrasive product in your plant. We maintain a field engineering service for that purpose. If you have a honing, superfinishing or grinding problem you are cordially invited to contact us and we will have a representative on your doorstep within a few hours.

We are particularly interested in helping you train your new and unskilled employees in the proper use of abrasive tools. Like every other production tool made there is a *right* way and a *wrong* way to use such things as grinding wheels, honing stones or coated abrasives. It is to our advantage to teach your employees to use them the *right* way. Therefore, our motive is threefold: We want to *increase your production.* We want to *push the war effort.* And we want to demonstrate to you that we manufacture *the world's most efficient abrasives.*

MID-WEST ABRASIVE COMPANY

Manufacturers of DEPENDABLE Abrasives

1960 E. MILWAUKEE AVENUE — DETROIT, MICHIGAN

Mid-West

★ *Honing Stones*
★ *Superfinishing Stones*
★ *Grinding Wheels*
★ *Emery Cloth*
★ *Sandpaper*

Mid-West Abrasive Company,
1960 E. Milwaukee Avenue,
Detroit, Michigan

Gentlemen: Please send me additional information on Mid-West Micro Bond honing and superfinishing stones.

*Name*_____

*Company*_____

*Address*_____

Prompt Delivery To War Industries
★
Shorten Employee Training Time With Covel Equipment
FOR VICTORY
BUY UNITED STATES WAR BONDS STAMPS

GIVE US THE *Right* TOOLS AND WE'LL DO OUR PART!

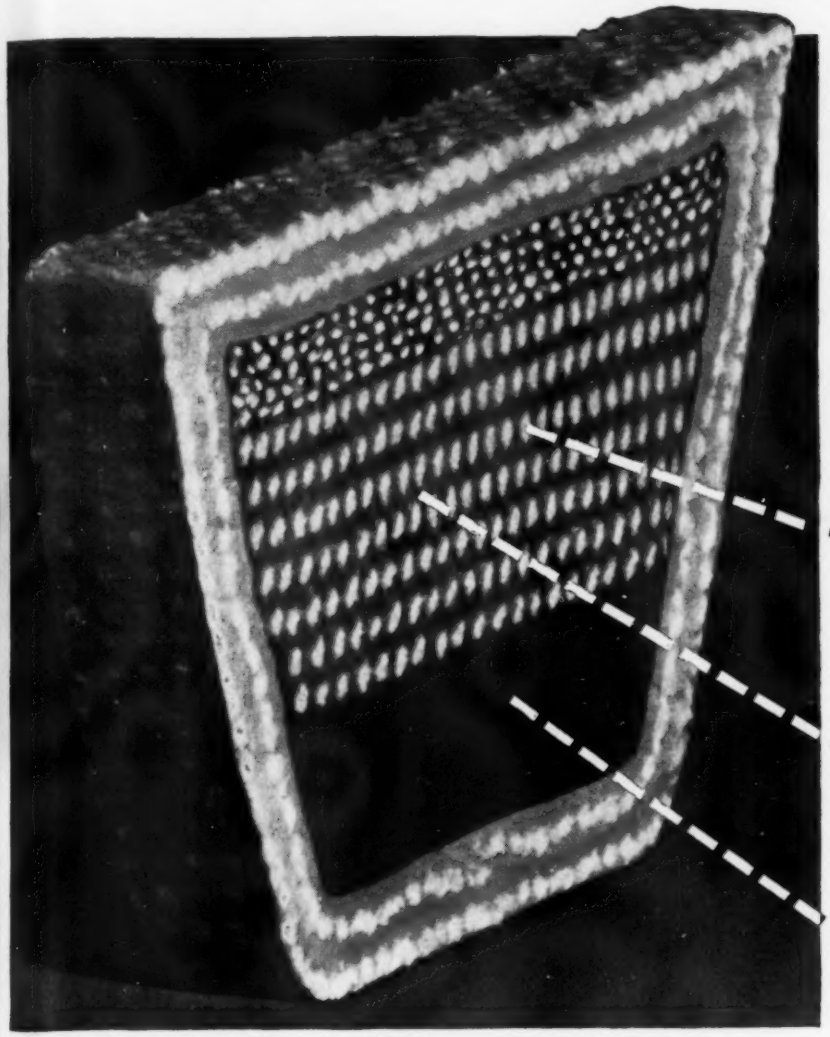
That's the spirit of the thousands of women doing work of men now serving in the armed forces. . . . And an ideal tool for women operators is Covel's No. 5 Hydraulic Surface Grinder (8″ x 24″). Sensitive, positive controls, conveniently located at proper height to relieve the operator from strain and fatigue, enable women to quickly become proficient in close-tolerance work. Features include low-pressure hydraulic system with all hoses eliminated. Pilot valve gives smooth table reversal at high speed. Hydraulic pump directly connected by flexible coupling to 2 H. P. motor. All oil seepage drains to sump in base of machine and is pumped back through filter to the oil reservoir Three speeds to grinding wheel. 2 H. P. Motor. Write, wire or phone today for Bulletin A-63.

Grinding Machinery Since 1874

COVEL INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICH.

Here's a Slice of LONGER V-BELT Life!



It's the section of a new Texrope Super-7 . . . and the new ways Longer Life is Built right into it Point to ways *You* can make Your V-belts last Longer.. whatever Brand you Use!

V-Day needs every V-Belt

50% STRONGER CORDS produced by the new Flexon process combat stretching. **YOU** can fight stretching—and the slip and burning that result — by promptly taking up any slack that may develop. Remember, many V-belts are now working four times as many hours a week as in peacetime, may need inspection *four times as often!*

★

20% MORE CORDS than before help protect the new Texrope Super-7 against strains and breaks. **YOU** can minimize breaks in your plant — whatever make of V-belts you use — by requiring that V-belts *never* be pried into grooves. For V-belts, prying is a back-breaking operation!

★

COOLER-RUNNING CUSHION of special rubber "eases" cords around sheaves—for smoother flexing and less heat. **YOU** can fight heat by preventing misalignment. It causes rubbing of belt sides, extra heat and shorter V-belt life. So keep sheave grooves in line—shafts parallel.

★

WHEN YOU DO NEED new V-belts, *invest in the best* — Texrope Super-7!

A 1543-A

FREE! Every engineer should have this valuable new handbook in his technical library.

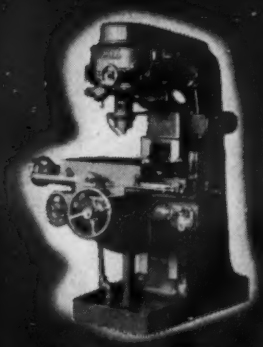
It applies to *all* makes of V-Belts—contains no advertising. Write Allis-Chalmers for it *now!*

ALLIS-CHALMERS

TEXROPE* SUPER-7 V-BELTS

WE WORK FOR VICTORY — WE PLAN FOR PEACE

*Trade mark registered U. S. Patent Office. Texrope Super-7 V-Belts are the result of the cooperative research and design genius of two great companies — Allis-Chalmers and B. F. Goodrich — and are sold exclusively by Allis-Chalmers. Available in all sizes..... ½ h.p. to 2,000 h.p.

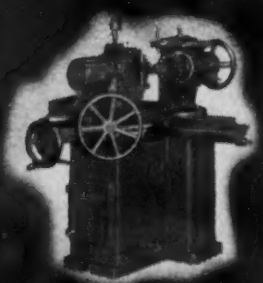


Rotary Head Milling Machine

Autometric Jig Boring Machine

Milwaukee Midgetmill

Milwaukee Speedmill

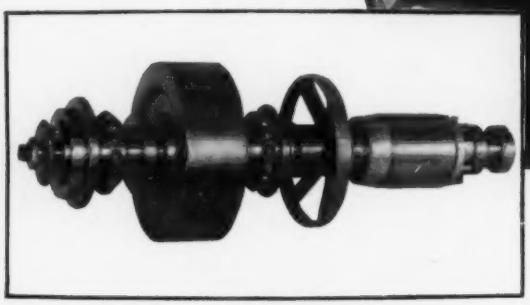


Milwaukee Face Mill Grinder

Center Scope

THE MILWAUKEE FACE MILL GRINDER GIVES YOU *ALL* THREE!

1. **UNUSUAL RIGIDITY**
2. **REDUCED SHARPENING TIME**
3. **ACCURACY TO WITHIN .0002**



The three-bearing spindle rotates at 3,400 R.P.M. and carries a heavy flywheel, the inertia of which when in motion successfully keeps the abrasive wheel up to grinding speed. Sharpening time has been considerably reduced as a result.

THE basic design of the Milwaukee Face Mill Grinder embodies strength, precision, and capacity. It is capable of sharpening Tungsten Carbide Cutters ranging from 3″ to 16″ in diameter — grinds the blades to within .0002.

Set-ups are quickly made with graduated dials, facilitating adjustments. Other controls are handily located for simplified operation.

OTHER IMPORTANT FEATURES:

1. Jeweled bearing dial indicator for accurate checking.
2. Finger tip control.
3. Fine thread precision saddle screw.
4. Hand screw permits angular setting of 15° on either side.
5. No adapters necessary.
6. Spindle has No. 50 National Standard Taper.
7. Blower system at slight extra cost.

For complete information write for Bulletin No. 41A

Buy Victory with at least 10% in War Bonds!

Kearney & Trecker Products

CORPORATION

MILWAUKEE, WISCONSIN

Subsidiary of Kearney & Trecker Corporation

NAVAL BATTLES ARE NOT WON BY SHIPS ALONE!

It takes the best of men and materials to come out victorious. We know our men are the best, so it's up to us in the Arsenal of the United Nations to secure the best machinery obtainable in production of the best munitions of war.

Note in this close-up action photograph how conveniently the operator controls the SUPER SERVICE RADIAL at the N. Y. Shipbuilding Corporation . . . the low, centralized position of all controls at the head contributes to tangible savings in time and a great reduction in operator fatigue. The New York Shipbuilding Corporation reports not only definite savings from the use of the SUPER SERVICE RADIAL, but also "an improvement as to accuracy, speed and ease-of-handling".

Drilling Condenser Head with the Super Service Radial at the New York Shipbuilding Corporation.

Awarded to The Cincinnati Bickford Tool Co. Sept. 10, 1942

THE CINCINNATI BICKFORD TOOL CO.

OAKLEY · CINCINNATI · OHIO · U. S. A.

THE NEW INDUSTRIAL DICTIONARY

Eighth revised (war) edition

A-mer'i-can—man or woman who works absolute maximum for war.

Ax'is—(definition censored)

de-moc'ra-cy—the right to progress—without interference—in proportion to your true worth. (Watch this word; many false definitions used by people who should know better.)

free'dom—the right to organize your own life. Often confused with "power of somebody else to organize your life *his* way."

gov'ern-ment—group of individuals, servants of the people. (Foreign definition—the people are servants of the government.)

ma-chine' tool—equipment without which no war product could be made.

man'age-ment—business men whose investment, organization and planning made war production and ultimate victory possible.

pro-duc'tion—method of measuring how sincerely a man or woman worker wants victory for America.

prof'it—what little is left after financing the war effort—security for the future.

vic'to-ry—the one word without which no other in the dictionary has any meaning or value.

WARNER & SWASEY
Turret Lathes
Cleveland

YOU CAN TURN IT BETTER, FASTER, FOR LESS
...WITH A WARNER & SWASEY

WHAT'S IN THIS ISSUE

O. W. WINTER

A. L. AINSWORTH

C. A. REIMSCHISSEL

WAR INFLUENCES TOOL DESIGN

Wars always accelerate technical developments and the present conflict has done much to speed up development of machine tools and metal-working methods. The demand for this rapid development has proved a golden opportunity for the tool engineer. Otto W. Winter, president, American Society of Tool Engineers, on the eve of that group's annual meeting and "Production Front Show," describes the important part the tool engineer has played, and may continue to play, in furthering the war effort. Page 95.

MACHINE TOOLS AFTER THE WAR

There will be several avenues of post-war utilization for the great quantity of machine tools now being built, writes Secretary of Commerce Jesse H. Jones. An analysis of the growth of the machine tool market and of the manner in which it has been financed, together with predictions for its position in the post-war world, constitute an article by Mr. Jones. Page 100.

BIGGER JOBS, BIGGER METHODS

Despite four-score years of experience in the construction of steam engines, boilers, and other heavy equipment, the John Inglis Company found it necessary to make a number of improvizations to increase machine tool capacity when they entered upon the manufacture of engines for Liberty ships. The changes in shop practices, the adaptations and the short cuts devised to accommodate these 2,500-hp. engines are described in an illustrated article by A. L. Ainsworth, vice president, John Inglis Company. Page 105.

TO LENGTHEN CHASER LIFE

Longer use may be obtained from chasers by purchasing them to proper specifications, grinding them correctly and using them in the right way. In ordering, consideration should be given to the type of metal to be worked, its hardness and the thickness of chip to be generated. Considerations in purchasing and the care of chasers are described by C. A. Reimschissel. Page 83.

REPAIR SPECIALISTS

A central repair department at the Nuttall Works of Westinghouse, Pittsburgh, rebuilds worn and over-aged machine tools for all the plants of the company. Dis-assembled to the last nut and bolt, machines are thoroughly inspected, parts replaced or repaired and in due time the whole unit is returned to service. J. A. Dorsner, superintendent, gearing department, Westinghouse's Nuttall Works, describes the steps followed. Page 92.

LARGEST PLANT PRODUCES BOYS

Production of the 78 principal parts that go to make up the Cal. 0.550 Boys anti-tank rifle calls for a multitude of accurate and careful machining operations in one of the largest arms plants in the world. Methods and practices utilized to produce these hard-hitting guns accurately and with the greatest speed are described. Page 112.

THE HALT LEAD THE BLIND

Like-unto Aesop's fable of the strong blind man who carried the clear-eyed cripple, to their mutual advantage, is the account of Caterpillar Tractor Company's program of hiring physically handicapped persons. Fitted to jobs in which their specific handicaps will be little or no hindrance, workers in the Caterpillar plant have proved satisfactory and the program of hiring them is being expanded. The experience of this company in its efforts to relieve the manpower shortage by hiring handicapped persons, is described and illustrated. Page 86.

TO MACHINE MAGNESIUM PERFECTLY

Though magnesium can be machined with any tools intended for use on hard metals, best results are obtainable through use of tools specifically designed for this metal. A. M. Lennie, Dow Chemical Company, describes the tools and practices most effective in drilling, reaming, tapping, threading and sawing magnesium. Page 88.

COMING

Under the stimulus of Navy and Army orders for Bofors 40-mm. anti-aircraft cannon, Chrysler Corporation is operating the largest arsenals in the world devoted exclusively to this weapon. High output quotas, coupled with scarcity of labor, materials and machine tools, posed thousands of problems in developing manufacturing methods for a 5,000-part cannon that was evidently made abroad only upon a toolroom or limited gun-shop basis. In an article to be published soon, American Machinist will depict Chrysler's application of mass-production technique to a number of different Bofors parts, as an indication of how the gun is being made on an interchangeable basis with a minimum of hand fitting required at final assembly.

Mechanized overhead conveyor lines, consideration of worker comfort, utilization of time and motion studies and of subassemblies designed and manufactured to keep work of the final assembly line at a minimum, contribute to the rapid delivery of Vultee Vengance bombers to the American and British air forces. Worker cooperation is increased by holding classes in work simplification and motion economy for shop supervisors and production workers. The details of this program, which has resulted in a progressive reduction of man-hours required per plane and of the floor space needed for a number of operations, will be presented in an early issue.

OFFICIAL PHOTO, U. S. ARMY AIR CORPS

A complete picture of the many uses of Cincinnati Press Brakes is covered in Catalog B-1. Write for your copy.

Runways for the "War Birds" are laid like a carpet—landing fields are built like magic—Cincinnati Press Brakes are at work on both planes and landing mats.

Their adaptability and accuracy may solve a production problem for you.

THE CINCINNATI SHAPER CO.

CINCINNATI OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

Getting The Most Out of Die Chasers

Buy chasers to do specific jobs. Grind them carefully using mechanical rests. Check throat and lip rake angles. Never overheat. In tempering, do not quench chasers in cold water

★ ★ ★

BY C. A. REIMSCHISSEL,
LANDIS MACHINE COMPANY

TEN TO 25 PERCENT of chaser life is wasted by improper grinding and improper use. Many chasers start life in the shop with two strikes against them because somebody didn't take the trouble to specify what he wanted to use them for.

How to Order Chasers

It's no secret that today tools must be made to give the most there is in them. To get the best service and the longest life out of chasers for dieheads and taps:

1. Order them, not as a housewife orders potatoes, but for the specific job each is to do. (Send sketch of work where possible.)
2. Make certain that chasers get fair treatment when they go to the grinding wheel.

As a general practice, manufacturers will supply chasers ground for threading steel unless other material is specified on the order. A chaser ground for steel has a higher rake angle than would be used for brass. Chasers made for steel cannot be used for brass until the high rake angle has been removed. When this happens, before the chaser has made a single cut a considerable amount of its life has been wasted.

In addition to the kind of material, its hardness should be stated, as in the case of heat-treated alloy steel. Chasers can often be given special treatment, such at nitriding, when the hardness of the material to be cut is known to the manufacturer. For instance, if standard chasers are to thread heat-treated steel testing 300 Brinell, they will not give nearly as good results as would chasers properly heat-treated for this particular material and hardness.

The third thing to specify when ordering chasers is the throat. A short-throat chaser may have only one imperfect tooth in the throat section. The ideal chaser would have a 15- or 12-deg. throat angle. This would allow about 2½ imperfect threads for the 15-deg. throat and three imperfect threads for the 12-deg. throat. A chaser with a 15- or 12-deg. throat angle can be made much harder and be given special nitriding treatment that often increases

the production life from 100 to 200 percent above that obtainable from a chaser with only one imperfect thread.

A chaser with a short throat generates a chip considerably thicker than that generated by a chaser with a 15-deg. throat angle. This can be seen from Fig. 1, in which a special 30-deg. throat chaser to generate a 0.0125-in. chip is shown. Fig. 2 shows a special 15-deg. throat chaser to generate a 0.0065-in. chip.

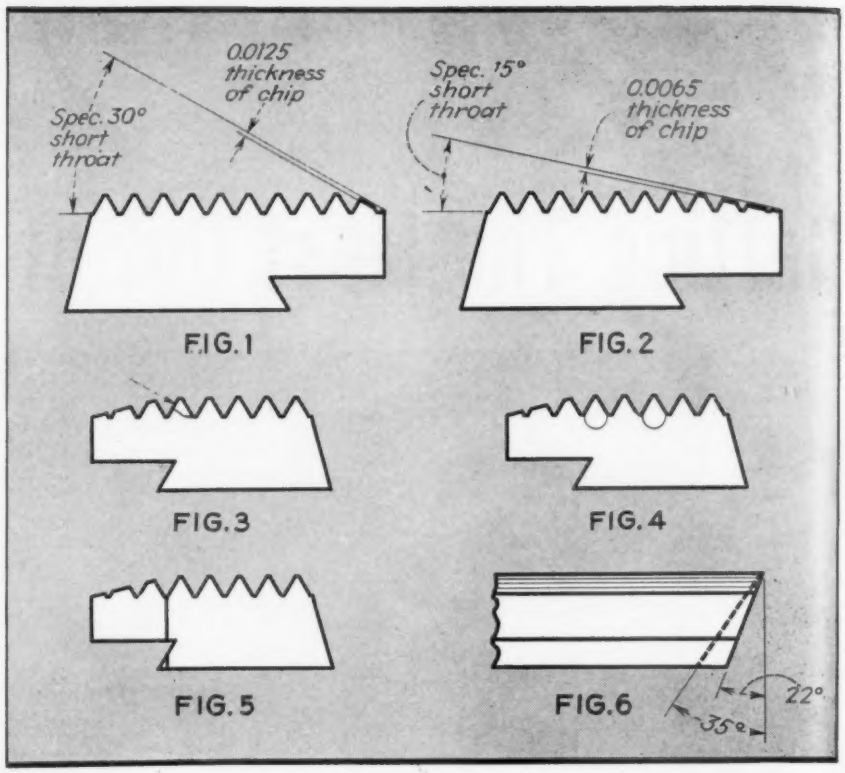
The chaser than generates the thinnest chip can be made hardest. If a chaser having a 30-deg. throat were nitrided to gage 64 to 65 Rockwell and used on heat-treated steel, the force that would be exerted against the single imperfect tooth could cause chaser chipping. If this same force were distributed over the 2½ imperfect teeth of a 15-deg. throat angle, then the chaser could be made much harder and still absorb the shock without chipping.

In many ordnance drawings, the width of relief at the end of the thread was designed for threads generated by milling. Considerable work has been done to obtain wider reliefs so that the threads could be more economically cut by the use of a diehead or tap. A cut thread is made faster than a milled thread and is more economical when chaser life is up to standard.

Chaser Failures

Fig. 3 shows a chipped chaser. The fracture was caused by force on the front angle of the chaser cutter serration. Such fractures are often caused by forcing badly sheared stock into the dies. Also, on an automatic screw machine, the cam for advancing the diehead up to the work sometimes travels so fast that the chasers are subjected to a severe impact when they strike the end of the work. This shock is particularly severe when using a 30-deg. throat chaser, or one in which the throat includes only 1 to 1½ imperfect threads. In some cases it has been necessary to decrease the hardness of the chasers to withstand this type of abuse. The cure for this is to decrease the angle of the starting cam to slow up the forward movement of the diehead.

The fracture shown in Fig. 4 generally results from overheating chasers by grinding on a dry wheel and then quenching in a bucket of water. When a chaser is heated the teeth heat faster and get hotter than does the body. And when the chaser is dipped into water, the teeth cool far more rapidly than the body. This results in a cooling strain traveling in a radius and setting up an almost invisible crack that fails under cutting pressure. The shop explanation is generally that the chasers are defective or that they have hit a hard spot in the material, while the real cause is overheating and quenching in water. High-speed steel will not stand this type of treatment without damaging the chasers to some extent.



Three imperfect teeth take the thrust in 15-deg. throat of chaser (Fig. 1). It can thus be nitrided to a greater hardness. Fig. 2 shows a short throat

Improper use causes chaser chipping. Fig. 3 shows crack caused by shock (arrow indicates direction). Fig. 4 shows chip caused by water quenching (note true radius at point of fracture)

Faulty grinding shortens life. In Fig. 5 the first full tooth should be included in lip rake. In Fig 6, excessive rake weakens cutting edge

How to Grind Chasers

More than one shop man has said that high-speed steel can be overheated without any detriment to its hardness. If a chaser is overheated so that it turns black and is not quenched in water, the chaser is damaged in that the hardness has been greatly decreased because of overheating at the cutting edge. High-speed steel chasers are drawn at a temperature of 1,000 to 1,050 F. to obtain the proper temper. When they are forced against a grinding wheel and turn black or discolor ⅜ in. back from the cutting edge, the threads have probably reached a heat anywhere from 1,000 to 1,500 F. At this temperature, Rockwell hardness drops from 2 to 4 points, C scale, shortening the life of the chaser. To determine the extent of the damage, Rockwell readings can be taken on both the overheated and the opposite ends of the chaser.

There is another common fault in the grinding of chasers. Often the throat includes practically 3½ teeth, but the lip rake grind does not take in the first full tooth directly back of the throat angle, as shown in Fig. 5. This tooth must be included in the lip rake; otherwise it does no cutting. With no lip rake on the first full tooth there is a galling action which overheats the work so that the metal welds and tears the thread. When this happens, the operator removes the chasers, assuming that they are dull, and regrinds them. Reground, they work no better and he grinds them once more. This happens most frequently when the chasers have been ground free-hand against a wheel without any mechanical rest. When grinding is done free-hand, no two of the chasers are ground alike.

Still another mistake is the grinding of chasers against the periphery of the wheel. Chasers ground that way lack uniformity, one of the greatest factors in the waste of chaser life. Chasers will often produce passable threads even though they are not uniformly or correctly ground, but they will produce

Properly ground chasers properly set in the diehead cut like this. Four uniform chips have been generated. Efficiency and long life are assured

Only two chasers are doing the work. The life per grind is probably 50 to 75 percent under par; the thread is poor in quality. Chasers should be reground and reset properly in the diehead

only a few, sometimes not more than six or seven. And in addition to short life between grinds, non-uniformly ground chasers may affect the lead or produce tapered threads.

All diehead and tap manufacturers make grinding fixtures and machines for grinding chasers mechanically correct. If a customer cannot buy a grinding machine or does not have enough work to warrant the purchase of a chaser grinding machine, there are chaser grinding attachments that can be applied to tool and cutter grinders. There are few grinders of any type for which an adjustable plate cannot be cheaply and readily made for lipping out the chasers against the periphery of the wheel so that uniform rake angles can be obtained on all the chasers in the set.

Even though proper grinding fixtures are available, a serious abuse frequently takes place when it is necessary to remove the worn section of a chaser to restore the cutting edge to its original condition. This is difficult to do without checking the grind as the metal is removed. In many places, the grinders are generally in an out-of-way position in the shop and seldom are they properly lighted to permit the operator to see when he has the worn surface removed.

There are operators who take chasers, place them in a vise, force them against a cup wheel, and grind approximately twice as much from the end of the chaser as was necessary. Often they do not even take the trouble to make sure it is the worn surface they are regrinding. Their main object is to grind so much of the chaser regardless of how badly it is worn. There have been cases where two chasers were clamped together, one probably extending $\frac{1}{16}$ in. beyond the end of the other, and both chasers roughed out. Without a doubt, twice as much was ground off as was necessary. To be economical when grinding chasers, leave a slight tell-tale mark of the worn surface on the cutting edge. It will not affect the cutting action.

Most chasers are ground dry, but in any plant which uses large numbers of chasers, wet grinding will do the job faster. In wet grinding, the flow of the coolant should be such that it keeps the high-speed steel chaser or tool that is being ground always cool. Insufficient coolant is worse than no coolant at all, because, with insufficient coolant, the chaser will heat up. Coolant splashing on the heated part has the same effect as is produced when a hot-dry-ground chaser is quenched in water. Grinding cracks are the almost inevitable result.

Force of coolant is not required; volume is. And the coolant should be flowed directly on the chaser points and against the wheel. Never direct the coolant so it strikes at a point back from the end of the chaser which is being ground.

Grinding Tap Chasers

Much the same rules that hold for die chasers apply to the grinding of tap chasers. Rake angles must be ground uniformly to assure even distribution of the load. When only two or three chasers are working they dull quickly, must be reground often, and have a short life.

Neither rake angles nor throat angles of tap chasers can be satisfactorily ground free-hand. Free-hand-ground chasers usually produce rough threads. To improve the finish the operator increases the rake angle to permit freer cutting action. When he increases the rake angle from the recommended 22 deg., raising it to 35 deg. as shown in Fig. 6, he has produced a cutting edge that lacks strength and will not absorb the heat generated by the cutting action. The finish is better, but the life of the chasers is extravagantly short and the high rake angles destroy the thread form on the work.

Radial relief tap chasers are often left in service too long between grinds. These chasers should be sharpened as soon as the cutting edge wears back sufficiently to produce a flat. Wear increases rapidly if the chaser is left in service. Piece-work operators will seldom change the chasers as long as they are cutting a passable thread. They are interested, not in chaser life, but only in the number of passable pieces they can get to maintain piece-work rates. A radial relief tap chaser is similar to a hob. Proven practice to increase life is to sharpen frequently and not run until total failure takes place.

All grinding wheels are made to be used at certain speeds, and all chaser grinding machines require different types of wheels to be used at certain speeds. These have been worked out by the manufacturers of the machines in conjunction with the manufacturers of the wheels. Chasers are frequently ground on wheels that are too hard. These tend to burn or cause rapid heating of the chasers and result in drawing the hardness. In every grinding room in which chasers are ground, a thorough check should be made on the type, grade, and speed of the wheel, to assure that proper equipment is given the grinding operator.

HOW TO SABOTAGE CHASERS

Buy chasers blindly. Grind them freehand. Use a hard wheel that will heat them, then dunk them in water till their teeth crack. Cut their throats with a wide angle. Do any or all of these, and poor work plus short chaser life are positively guaranteed

Physically Handicapped Workers Ge

These two men are helping relieve the manpower shortage at the Caterpillar Tractor Company plant in Peoria, Ill. Arthur Russell, operating a ditto machine, lost his right hand in an accident six years ago. Lloyd Smith, who lost an arm in a hunting mishap, is a clerk in the reclamation department

Russell Thrasher suffered an attack of infantile paralysis when three years old, and wears a brace on his right leg. He is now engaged in hand tapping, hand reaming and burring operations on tractor transmissions. Before being trained for this work, he was employed for many years as a taxicab driver and oil station attendant

Men who have lost an arm, a leg, a foot or hand, and those who are deaf or blind, have proved to be capable workers. Analysis of jobs reveals they can do work heretofore thought impractical

WORLD WAR II, with its attendant manpower shortage, is giving physically handicapped persons a chance to prove themselves at Caterpillar Tractor Company which is devoted 100 percent to production of war materials. Results have been most gratifying. The physically handicapped, eager to devote their energies toward winning the war, have shown complete willingness to follow instructions. Their cooperation and ability to apply themselves to the jobs selected for them after careful analysis of their capabilities and limitations has enabled them, generally, to do a splendid job.

Caterpillar has already decided to continue and expand its policy of hiring the handicapped. This in itself is indicative of the good job these folks are doing. Included among the handicapped employed in the Peoria plant, where more than 16,000 keep the wheels turning day and night, are those who have suffered the loss of an arm, hand, leg or foot, those who are blind or deaf, and many who have been left partially disabled either through the ravages of infantile paralysis or through fractures and other injuries.

They are engaged as bench men on mechanical and hand burring operations, wash-tank operators, final inspectors, toolcrib window men, repairmen for cleaning and maintaining safety goggles and glasses, stock chasers, factory clerks and sweepers. In several instances they have been trained as machine tool operators.

Set-ups Fitted to Workers

Some of those employed have been trained in technical and vocational schools for machine tool operations and for operating small portable tools. Others have been trained by Caterpillar for their jobs. In some cases jobs have been studied and set-ups have been revised enabling physically handicapped workers to be employed at work which normally would not be considered suitable for them. This is particularly true of those jobs where revisions in set-ups lessens fatigue. Ef-

Get Their Chance

George Pople is blind, yet he is a fast and capable worker at his job of cleaning and repairing safety glasses and goggles. He received training in this work at Bradley College and the Jacksonville, Ill., School for the Blind. Work for all handicapped people is studied by both the Personnel and Medical Departments

The loss of a foot has not prevented George Clinch from becoming proficient at burring small tractor parts on the bench grinder shown in the background. He gets around with complete ease on an artificial foot, and has held several jobs in industrial plants on grinding operations as well as crating and assembly work

forts have been made to utilize the services of blind workers who received primary, and often complete training, in schools and colleges; in several instances final training has been given in the plant on such jobs as repairing and cleaning safety glasses.

Caterpillar's personnel division cooperates closely with the medical division in placing handicapped employees on jobs they are physically able to perform. Each person is approved by the medical division for a specific job, and if a change in jobs is proposed, permission must first be granted by the medical division.

At present a complete survey of the entire plant is underway by the personnel division, aided by the factory training department. Questionnaires have been provided every supervisor and when the reports are tallied, it will be known exactly how many jobs in every department can be filled by handicapped men. The report will be broken down to classify the particular type of physically handicapped persons who can handle each of these jobs. In addition, supervisors will recommend revisions in the plant, such as installation of brackets and conveyors, for jobs which with such revisions can be turned over to a handicapped person.

Confident of Their Ability

Every handicapped employee placed on the payroll replaces a man who has joined his country's armed forces, or releases an unhandicapped employee for some other war job.

One of the most important things in the minds of these new employees is the fact that they are now able to do their bit for Uncle Sam. Unable to fight on the front lines, they are happy at the chance to fight on the home front. Without exception the handicapped employee has great confidence in his own ability. Many have loved ones in the service and doubly appreciate a chance to back them up at home, both by helping produce war material and by buying war bonds with part of their income.

Caterpillar's safety program, under which employees of the company are establishing new all-time low lost-time accident records in the face of a general national increase, has no greater boosters than those handicapped employees. Typical is a bench worker who suffered the loss of a foot in an industrial accident years ago. "I'd like to tell every fellow employee personally to practice safety," he says—"for the good of himself and for his country."

Use the Right Tools

Drills, reamers, taps, thread chasers and other tools used on hard metals will produce fair results on magnesium. But for quality work, long tool life, and reduction of any fire hazard, use those designed specifically for this metal

BY A. M. LENNIE, DOW CHEMICAL COMPANY

THREE TYPES OF DRILLS will effectively handle all drilling operations in magnesium and magnesium alloys. These are designed for sheet-metal work, shallow holes where the depth is less than five times the drill diameter, and deep holes.

Magnesium sheet stock can be drilled with a sharp standard drill having a 118-deg. point angle. But for accurate holes with good finish, minimum burr, and high production, slightly modified drills should be used. The point angle should be reduced to approximately 60 deg. to prevent "walking" of the drill, reduce the thrust, and prevent break through. The chisel edge angle should be from 120 to 130 deg., the web thinned, and the corners rounded. A thin web at the point helps center the drill and reduces thrust, while the rounded corners provide a smooth finish and reduce burrs. To prevent the work from climbing the drill on break through, the helix angle should be approximately 10 deg. This type of drill, which can be ground readily from a standard drill, is shown in Fig. 9. A flat ground on the cutting edges of a higher helix drill gives the same effect.

Drills for Shallow Holes

When drilling holes of a depth less than five times the drill diameter, standard point angles of 118 deg. and chisel-edge angles of 125 to 130 deg., which give a relief angle of approximately 12 deg., will give the best cutting action. Point angles from 70 to 118 deg. can be used, and spur points can be added if spiraling is encountered. Rounded corners will give accurate holes and good surface finish. The helix angle should be from 10 to 30 deg. Highly polished flutes will facilitate the flow of chips out of the holes. Fig. 10 shows a drill recommended for shallow holes. It is important, no matter what type of drill is used, that the cutting edges be kept sharp. Dull drills will give poor quality finish, undersize holes, burrs, and will heat the work.

Drilling Deep Holes

Holes up to twenty times the drill diameter can be drilled in magnesium with speed and precision. However, such drilling produces a great quantity of chips which must be guided out of the hole through a considerable length of drill flute. Only drills with a helix angle of 40 to 45 deg. will do this satisfactorily. Open and polished flutes, with large chip spaces, minimize chip friction. For this reason, the web should have a constant thickness for the entire length of the drill.

Chisel-edge angles of 135 to 150 deg. are essential for providing good surface finish and minimizing spiraling in the hole. Angles smaller or larger than those recommended cause difficulty due to improper relief at the cutting edge and improper centering of the drill.

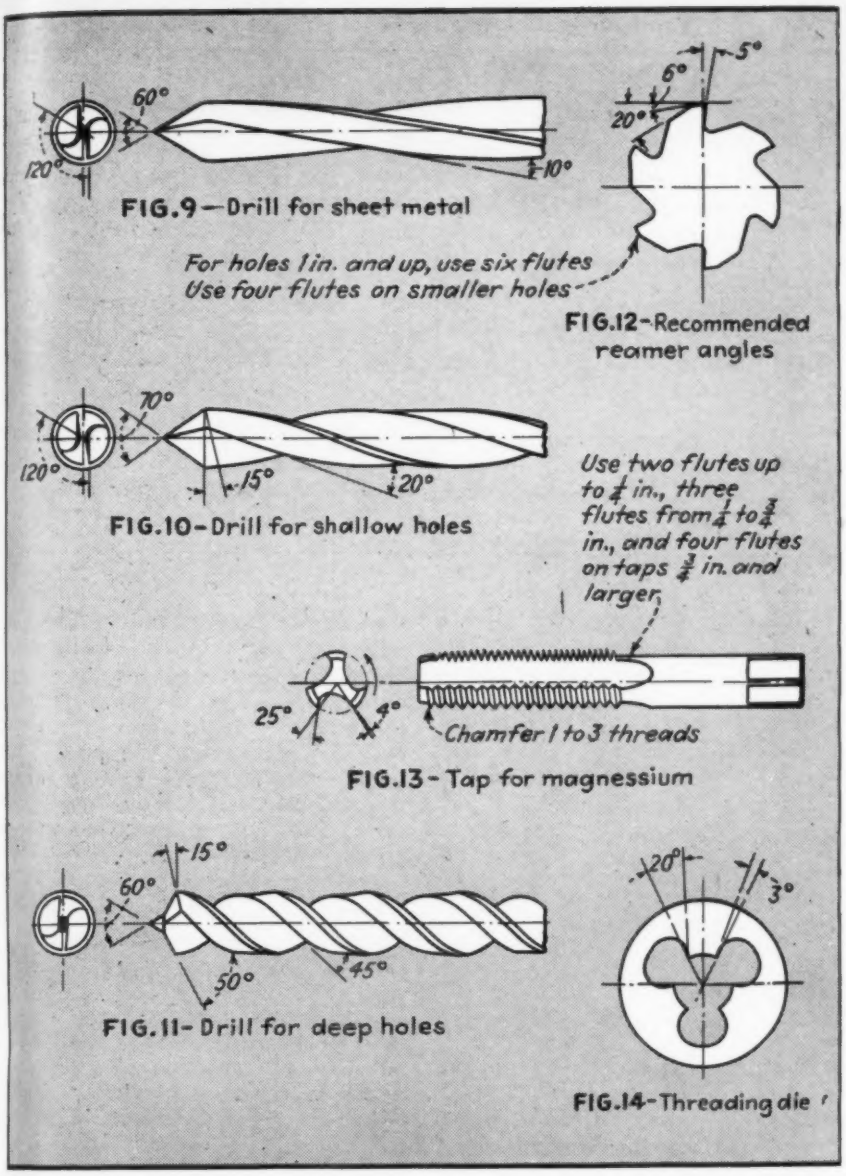
The standard drill point angle of 118 deg. has been found to be most satisfactory when drilling deep holes. If spiraling or run-out is encountered in very deep holes, a spur or pilot point ground at the center of the drill will correct the trouble. The recommended angles for deep-hole drills are shown in Fig. 11. Such drills can be used without withdrawing from the hole to clear the flutes. This fact is of particular importance when drilling with multiple-spindle and automatic machines.

All drilling in magnesium should be done at the maximum speed attainable on the drilling equipment. Speeds commonly used are 100 to 300 surface ft. per min., although those up to 2,000 ft. per min. have been reported. Decreased machining time, improved surface finish, and accurately drilled holes result when high speeds are used.

Feeds should be heavier for magnesium than other metals in order to secure proper chip formation. Small drills, in the range of $\frac{5}{32}$ in. diameter, work best with feeds around 0.005 in. per revolution—the chips are either slightly coiled or ribbon-like and feed out through the drill flutes without jamming. Drills around $\frac{1}{2}$ in. diameter should be used with feeds of 0.014 to 0.020 in. per revolution. Chips formed with these feeds have minimum bulk and are removed easily even from very deep holes. In drilling shallow holes, wide divergences from these recommended feeds are allowable, but in deep-hole drilling the recommendations should be followed closely to avoid jamming the drills, which necessitates lifting them from the work to clear the flutes. Recommended drilling speeds and feeds are given in Table 4.

Recommended Reaming Practice

Reamers for magnesium alloys should have fewer flutes than normal. Four flutes for small holes and six flutes for holes 1 in. and larger are recommended. The flutes may be straight (0 deg. helix angle) or have a helix angle of approximately 10 deg. Rake angles should be from 5 to 8 deg., relief angles from 4 to 7 deg., clearance angles from 15 to 20 deg., and lands should be 0.010 to 0.025 in. wide. In some cases no margins are used to secure a free cutting reamer. Fig. 12 shows recommended angles. Standard reamers used for steel can



These tools are designed specifically for working in magnesium. When kept sharp, they produce high surface finish, permit high machining speeds, and at high speeds hold work heat to a minimum. A wide variety of mineral-oil cutting fluids can be used when machining magnesium. Water-soluble and oil-water emulsions, although good coolants, should not be used

be used for magnesium, but where quality results are necessary the recommended tool should be used.

High cutting speeds and medium feeds with sharp reamers give the best finish and most accurate holes. Speeds commonly used in commercial practice vary from 100 to 400 surface ft. per min., but these are much lower than the possible maximums. Carbide-tipped reamers prolong tool life and improve the quality of surface finish. A definite cut should be taken with the reamer; otherwise, the metal will compress, resulting in an undersize hole with poor surface finish.

Standard taps can be used for threading magnesium where threads do not have to be held to close tolerances. High production and close tolerances, such as necessary for Class 3 and 4 threads, require taps designed specifically for magnesium. Taps recommended are ground high-speed steel straight-fluted concentric types with a front rake angle of 10 to 25 deg., a back edge or heel rake angle of 3 to 5 deg., and a chamfer of 1 to 3 threads. The use of a heel rake and elimination of radial thread relief provides a cutting action on backing out which prevents jamming of the chips and produces a clean accurate tapped hole. In addition to being cylindrical, the lands should be narrower than normally used.

Two-fluted taps should be used on holes up to $\frac{1}{4}$ in. diameter, three-fluted taps on holes from $\frac{1}{4}$ to $\frac{3}{4}$ in. diameter, and four-fluted taps on larger holes. Fig. 13 shows a tap correctly designed for magnesium. Taps with special features and interrupted threads can be used with success on certain jobs, but for all general purposes, the tap design in Fig. 13 will suffice. Tapping speeds or 75 to 200 surface ft. per min. are recommended.

If a tendency is observed for a tap to cut oversize, the rake angle should be decreased; conversely, increasing the rake angle will make a tap cut larger. Dull taps will cut undersize and give poor surface finish.

Standard tapping heads and tapping machines work satisfactorily on magnesium, but experience has shown that machines utilizing a leadscrew to establish the pitch of the threads will produce the most accurate threads. This is due to the fact that errors in lead and poor surface finish are caused by inadvertently forcing the tap which in the relatively soft magnesium prevents the tap from following its own lead accurately.

Dies for external threads should have the same cutting angles as the taps, and the lands should be as narrow as possible to secure adequate chip clearance. Fig. 14 shows the type of die recommended. Self-opening dies will give threads of maximum smoothness.

Tools for Automatic Screw Machines

The same tool materials are used in screw machines as in lathe or milling work. High-speed steel will work satisfactorily, but the more abrasion-resistant carbide tools will give longer tool life. The higher initial cost of the carbides is more than offset by the savings effected through less down time due to fewer tool resettings. Special attention should be paid to relief angles, clearance angles, chip spaces, and sharpness of the cutting edges. The following recommendations emphasize the features of tools which are important:

Drills—Shallow holes do not require special drills, but deep holes require drills with a 40- to 45-deg. helix angle. Recommended designs are shown in Figs. 10 and 11.

Form Tools—Wherever possible, relief angles on form tools should not be less than 8 deg. Rake angles from 0 to 10 deg. are satisfactory with the 0 deg. rake giving better chip breakage. The ratio of maximum width of cut to diameter of the workpiece is approximately 2 for magnesium alloys.

Box Tools—Relief or clearance angles on box tools should be about 10

deg. and the cutting angle from 5 to 10 deg. With the free-cutting magnesium alloys, no special features on box tools are necessary.

Taps and Dies—Designs of taps and dies for screw machines should follow the recommendations previously given for tapping and threading magnesium, including those in Figs. 13 and 14. Thread chasers may be used to produce both external and internal threads; the cutting angles should approach those used for turning tools with particular attention given to the sharpness of the cutting edges and proper relief angles. Cutting speeds with thread chasers may go as high as 1,000 surface ft. per min.

Due to the close tolerances in screw-machine work, and the necessity of holding constant sizes over a considerable period, a mineral oil cutting fluid is recommended on certain jobs no matter what cutting speed is used. The cutting fluid is used to control thermal expansion. On simple jobs it may be possible to eliminate the cutting fluid inasmuch as only a small quantity of heat will be generated and no appreciable improvement in tool life or surface finish will be obtained by its use.

Recommendations for Saws

Magnesium is readily cut with all types of saws. Due to low cutting pressures, large cuts are taken per tooth, which necessitates the design of large chip spaces to permit the saw to remain free cutting. Too small a tooth pitch or chip space will cause the saw to ride over the work and rapidly dull the teeth. A maximum of 4 to 5 teeth per in. is suggested for band saws, while a tooth pitch of 0.5 to 1.5 in., depending on the saw diameter, is best for circular saws. A tooth set of 0.02 to 0.05 in. is necessary for both band and circular saws to insure free cutting. Special teeth profiles as used in circular saws will enhance free cutting action. Feeds up to 80 in. per min. are possible with circular saws.

Cutting speeds up to 15,000 surface ft. per min. may be used with circular and bandsaws, depending on the size of the saw and the work. The best quality saws should be used to obtain good service life. Carbide-tipped circular saws should be used wherever long saw life is desired. The operation of bandsaws is improved by the use of a tallow stick to reduce friction.

Hand hacksaws should have approximately one-third to one-half as many teeth as saws designed for cutting steel. Blades 0.02 to 0.03 in. thick by ½ in. wide with 10 to 14 teeth per in. are satisfactory.

Power hacksaws vary greatly according to the size of the machine. A medium size unit for production work will take a saw with a tooth pitch of 0.5 in., a tooth set of 0.03 in., large chip space, wide blade, and a thickness of $\frac{1}{16}$ in. Cutting speeds can be very high due to the low temperatures produced in cutting. The maximum speed possible with a heavy pressure is recommended.

Table 4—DRILLING RECOMMENDATIONS

Type of drilling	Drill	Drill dia., in.	Surface speed, ft. per min.	Feed, in. per revolution
Sheet	60 deg. point angle Rounded corners Thinned web 10 deg. helix angle	¼ ½ 1	300 to 2000 300 to 2000 300 to 2000	0.005 to 0.030 0.010 to 0.030 0.010 to 0.030
Shallow holes	70 to 118 deg. point angle 10 to 30 deg. helix angle 120 to 135 deg. chisel edge angle	¼ ½ 1	300 to 2000 300 to 2000 300 to 2000	0.004 to 0.030 0.015 to 0.040 0.020 to 0.050
Deep holes	118 deg. point angle 40 to 45 deg. helix angle 135 to 150 deg. chisel edge angle	¼ ½ 1	300 to 2000 300 to 2000 300 to 2000	0.004 to 0.008 0.012 to 0.020 0.015 to 0.030

Table 5—PROPERTIES OF CUTTING OILS

Specific gravity	0.79 to 0.86
Saybolt viscosity at 100 F.....	Up to 55 sec.
Flash point, minimum value (closed cup).	160 F.
Saponification number, maximum.....	16
Allowable free acid, maximum.....	0.2 percent

The Value of Cutting Fluids

Cutting fluids are used when machining magnesium primarily to cool the work and reduce the fire hazard. Improvement of finish and increased tool life are minor considerations.

Machining of irregular shapes and thin sections which might be distorted, and multi-tool set-ups which create local heating are examples of where mineral oil cutting fluids should be used. In automatic machines some allowance must be made for thermal expansion inasmuch as the cutting fluid will attain a constant temperature slightly above that of the room. If desirable, the temperature of the oil can be reduced by passing it through a cooling unit which can use tap water as the cooling medium.

When fine chips are produced at high cutting speeds in machining magnesium, a fire hazard exists. Although sharp tools greatly reduce this hazard, and cutting feeds must be in the range of 0.001 in. and less to create fires, uncertainties of operation make it necessary to take precautions against this hazard. The presence of iron or steel inserts and sand cast surfaces which are apt to spark when hit by the cutting tool also add to the fire hazard. A stream of cutting fluid amounting to 4 or 5 gal. per min. will practically eliminate the fire hazard.

Properties of Cutting Oils

A wide variety of mineral-oil cutting fluids can be used. Almost any oil will reduce the fire hazard if applied in sufficient quantities; however, to secure adequate cooling, the cutting oil must have low viscosity. Since low viscosity mineral oils have a low flash point, a fire hazard due to the oil is encountered. This necessitates a compromise between cooling power and flash point. Table 5 gives the range of properties of satisfactory cutting fluids. Additives which decrease the surface tension and increase the wetting power of the cutting fluid have been found beneficial.

The chemical nature of magnesium also dictates that the free acid content of cutting fluids should be below approximately 0.2 percent, and that the use of vegetable or animal oils, which may oxidize and increase the acid content, be restricted.

Water-soluble oils and oil-water emulsions, although good coolants should not be used on magnesium. They react with the machined chips to form explosive hydrogen-oxygen mixtures as well as to intensify greatly any chip fires which might be started.

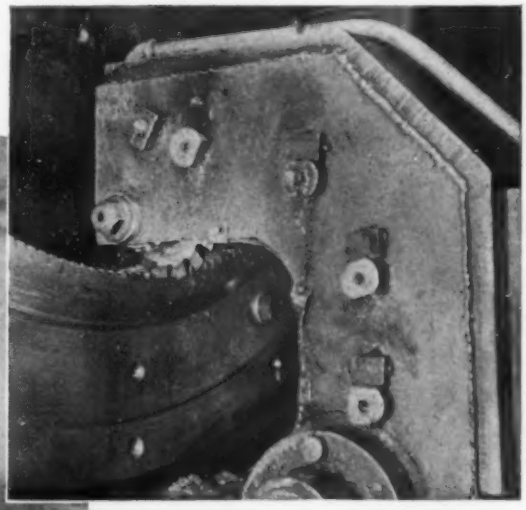
Part 3 of this article will appear in an early issue.

Special Set-up Cuts Internal Gear

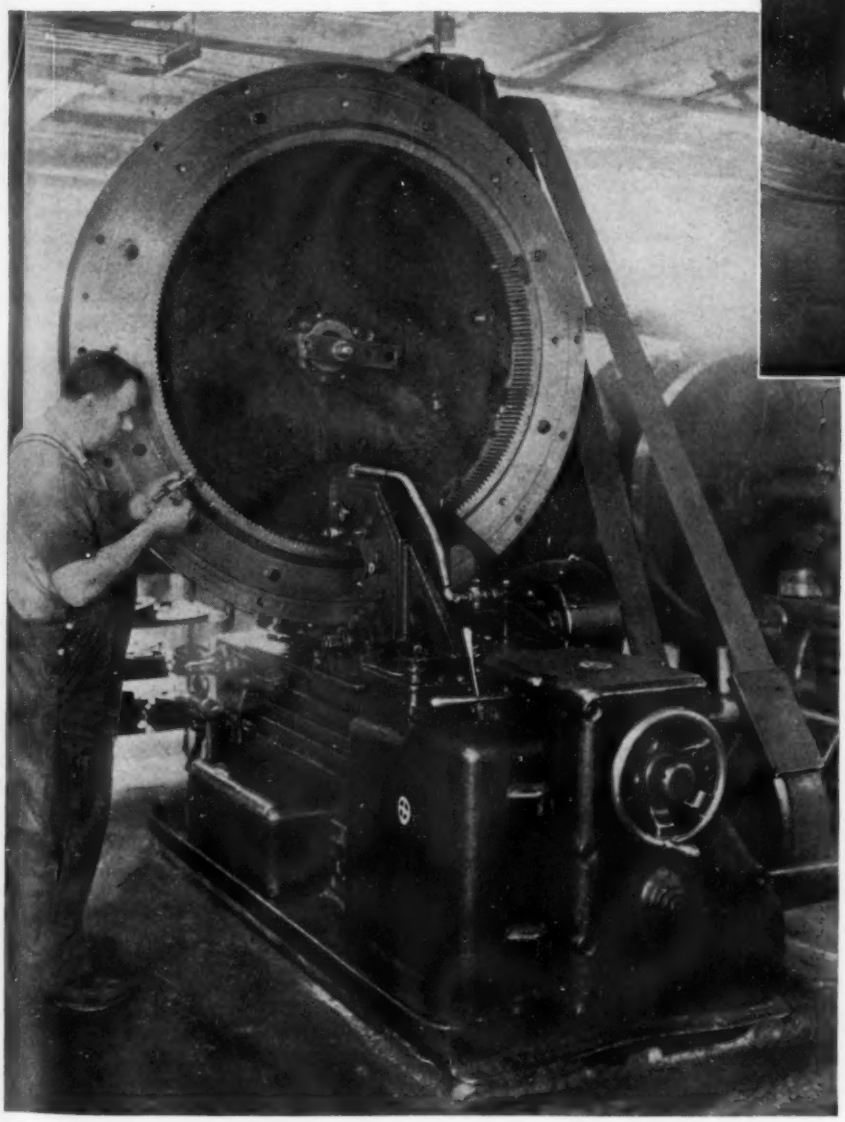
BY H. D. BURBINE, GEAR DEPARTMENT, GENERAL ELECTRIC COMPANY

RECENTLY the Navy Department urgently need three internal gears for an important war application. These gears were to be of 5-pitch, 48-in. pitch diameter, 240 teeth, and 5 ft. 5¾ in. outside diameter. Navy records showed that the nearest equipment designed for cutting an internal gear of this character was located several hundred miles from the issuing point. The entire project would be unduly delayed if it were necessary to ship the gear blanks to this point for machining and then return them to the original plant. It looked as if that would have to be done, since no equipment designed especially for cutting an internal gear of this size was available. After studying the job, the problem was solved by using a 72-in. external gear cutting machine set up with a special attachment in the following manner.

A fixture that had been used in cutting external railway gears was adapted to fit the dimensions of these internal gears and provide support for the gear blank while cutting. The blanks were mounted with space blocks, providing space between the blank and faceplate to permit passage of the cutter completely across the face of the large gear.



A gooseneck attachment, with a gear train run by the spindle of an external gear cutting machine, was used to drive the cutter for machining 240 teeth in this 5-ft. internal gear



A gooseneck attachment originally constructed in the shop for cutting slots in railway spring gears, but not used for several years, was resurrected. This gooseneck is built up from heavy steel plates cut to shape and assembled by welding to make a box-section structure. The side plates of the gooseneck were drilled and bushed to retain the shafts for a gear train that is driven off the main spindle of the 72-in. external gear cutting machine. The gooseneck is bolted to the bed of the machine over a pinion gear fastened to the spindle. This pinion transmits power through the gear train to the spindle at the outer end of the gooseneck. A cutter of the proper size and pitch to cut the teeth in the large internal gear is mounted on this outer spindle. This cutter replaced the slotting cutter used in the original set-up.

The three internal gears for the Navy job were cut in 76 hours with this set-up. An important job was thereby accomplished without delay.

Keeping Old Machines in Service—for Wa

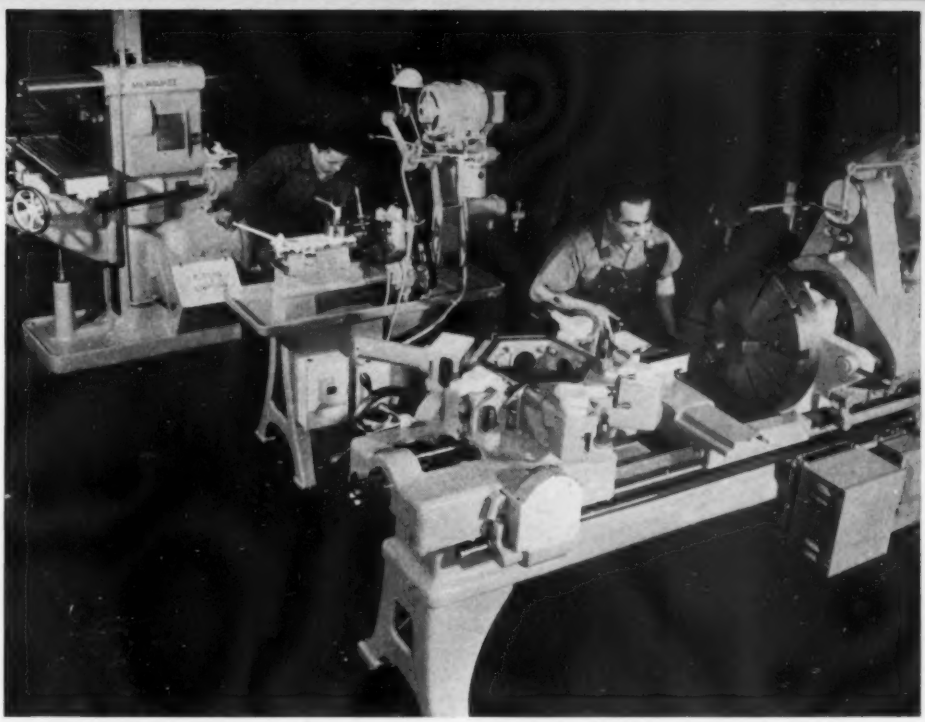
Why not centralize machine tool repairs? All worn out and over age units from all Westinghouse plants are sent to the Nuttall works. Specialists rebuild them

Upon arrival at the centralized repair department, the machines are completely dismantled. All parts are tagged with machine and order number, and after cleaning they are inspected for renewal or repair

Ways and columns of every machine are checked for wear and alignment. Sections of worn ways are often machined out and replaced by seasoned sections that are dovetailed and locked in place. Run-out of repaired ways is held to 0.003 in. in lengths up to six feet

For War Needs

BY J. A. DORSNER
WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY



After all measurements and checks on the rebuilt parts meet requirements, the machines are run-in and tested. When performance and accuracy have been established, they are painted in two tones. Moving parts and levers are buff color, while the machine proper is light gray

WORN AND OVER-AGED machine tools are being repaired and placed in service today to meet the ever increasing demand in production of war material. Such work is handled for all Westinghouse plants by a central machine tool repair department in the Nuttall Works at Pittsburgh. To date, 21 different sizes and types of machines have been received and are in various stages of overhaul.

The problems involved in the repair of these machines tax the ingenuity and skill of the workmen, as most of the machines received date in design back to 1905. The reasons for overhauling these machines are due principally to worn bearings, worn vees and ways, and mis-alignment of the movable parts. Another reason is that the machines have been used for a number of years for single-purpose work with the carriage restricted to a certain position causing undue wear in that position; therefore, when shorter or longer jobs are to be machined the work is not true or accurate.

Completely Dismantled and Inspected

As the machines are received they are promptly uncrated and thoroughly cleaned outside the plant. They are then completely dismantled to the last nut and bolt, and all parts are tagged and identified with the machine and order number. All parts are then thoroughly washed and cleaned. Each individual part is inspected to determine if it is usable or not. If the part does not measure up to the machine tool standard, it is rejected and a new part furnished. The ways and vees are checked to ascertain if re-machining, scraping, or both are required. If re-machining is required on the bed, column, or other major machine parts, complete information and instructions are issued to the department doing the work. The ways and vees are machined just enough to remove deep scars, defects, or any other irregularities to restore a true surface. After machining, all parts are scraped to straight edges, surface plates, and other gages made especially for this repair operation. Indicator readings do not exceed 0.002 to 0.003 in. in lengths up to 6 ft. While this operation is being performed, replacement parts are ordered and work continues to the point of re-assembly.

When all parts are received, the general re-assembly of the machines begins. It is at this point that the most difficult operations start; that is, checking the alignment of all movable parts. The accuracy of the vees and ways is checked for true heights of head and tailstock; center distances must be maintained, and all movable parts must operate freely. After all measurements and checks meet the requirements, the machines are given a mechanical run-in and test, and then a final overall check. When the machine repair foreman is satisfied that high performance and accuracy are established, the machine is released for painting. Moving parts and operating levers are painted in darker colors than other parts of the machines, since such a color scheme relieves operator eyestrain and fatigue.

Problems Faced by the Rebuilder

After painting, the machines are given a final inspection. They are then crated and shipped back to their own plants, and there take their places in the production lines, producing more work and making more accurate pieces.

During the repair of these machines, several unusual conditions were encountered that required sound thinking and judgment to overcome. In one case a section of a way, about 8 in. long, was worn $\frac{3}{16}$ in. deep by entrapped chips. To plane the entire length of the way was out of the question. It was decided to mill a rectangular section from the way, secure a well seasoned piece of material, machine it to the same shape, swedge it into place, and lock it in position by dovetails, pins and locking screws. A similar condition was encountered on the column of a milling machine.

Another case was that of the bearing surface of a long lead screw which was badly damaged. This surface was machined undersize and built up by welding. It was then straightened and machined to size.

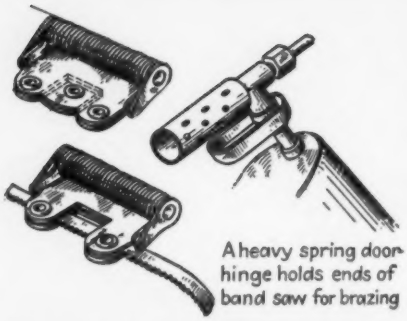
No part is scrapped unless it is absolutely beyond repair because most of these machines have been in service from 30 to 40 years, and there is a shortage of the materials that would be needed for them.

In order to provide proper scheduling and prompt delivery, a scheduling system was established wherein all machines sent to the Nuttall Works are given a class letter, such as A, B, or C, as a guide to the order of preference given the machines. This classification is arrived at by the Headquarters Equipment Department after checking the need for the equipment in the production schedules.

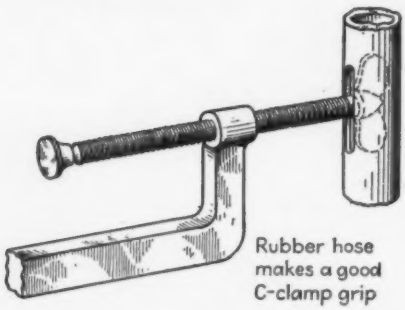
As soon as the machines are received and dismantled, an estimated delivery date is furnished the Headquarters Department for submittal to the works or division that have forwarded the machines for repair. This permits them to arrange their schedules accordingly.

SHORT CUTS FOR THE SMALL SHOP

BY A. H. WAYCHOFF

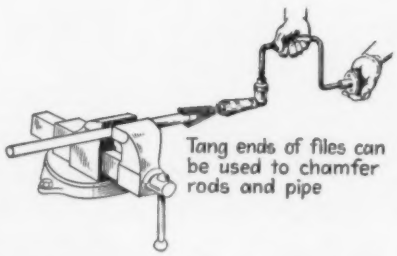


SOLDERING BAND-SAW blades requires some means for holding the broken edges in line. When standard equipment is not available for this purpose, a heavy-duty spring door hinge can be used. After removing the center section of the hinge as shown, the spring tension will hold the scarfed ends of the blade in line for brazing the joint.

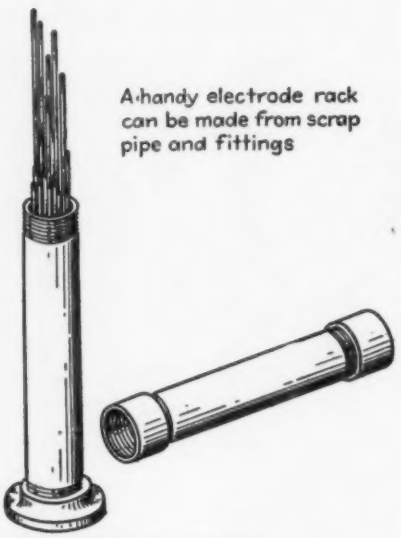


HANDLES made of rubber hose provide excellent grip for tightening C-clamps. Make them of 5-in. lengths of garden hose, so slitted to prevent it from being pulled easily off the clamping screw. Sufficient pressure can often be applied to eliminate the use of a wrench. One handle will do for several clamps.

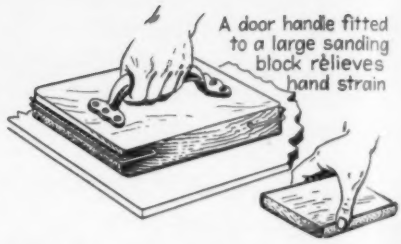
GREASE CUPS must be filled at regular intervals. When there are a large number of such cups to be filled, it is a slow job to unscrew the cap, insert the grease, and replace the cap. It is often difficult to start the cap when an excess of grease is used; hence, most cups do not get filled properly. Cups will be filled to capacity, and time will be saved, by applying Alemite, Zerk, or other pressure fittings to the cap. When the cup is empty, the cap can be backed off to its top position, and grease inserted with a pressure gun.



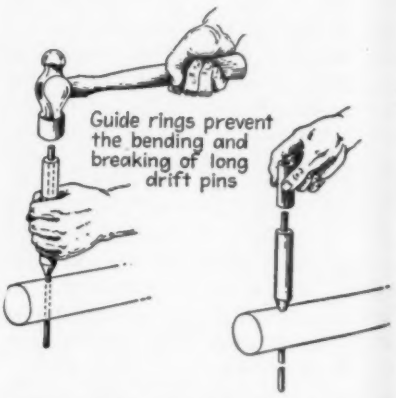
CHAMFERING TOOLS are needed frequently for rounding the ends of rods, bolts, and pipes. One way of doing such work is to snap off a couple of files, leaving two or three inches of the tang end and placing them in a brace for use as shown in the drawing. Usually, that portion of the file adjacent to the tang receives little wear; hence, when the remaining portion of the file is worn out, the tang ends can be used effectively as here described.



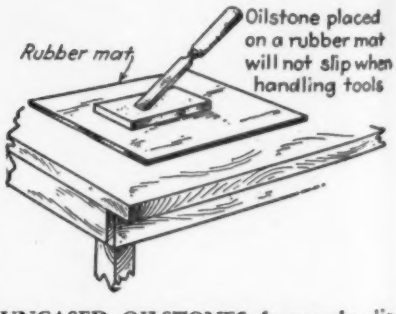
ELECTRODE HOLDERS for a generous supply of rods can be made from scrap pipe and pipe fittings. A section of pipe, threaded at both ends, is screwed into a flange for bolting to the floor or work bench. The flange is fitted with a plug. When not in use, a second length of pipe, fitted with a sleeve and cap, can be screwed on this holder, covering the electrodes as a safeguard against bending and theft.



SANDING BLOCKS, especially large ones, can be fitted with ordinary drawer handles for exerting maximum pressure without undue strain on the hand. Spreading the hand to grasp wide blocks is tiring and necessitates frequent rest. The sandpaper can be held in place by wires running through holes drilled in the blocks.



DRIFT PINS with long points frequently bend or break under heavy hammer blows. This can be avoided by using the illustrated guide. It is made from a length of hard alloy steel, beveled at one end and drilled to receive the drift pin. For extremely long points, a secondary guide, flat on both ends, can be used; when the drift pin has been driven flush with this secondary guide, it can be removed, exposing the drift pin for further driving.



UNCASED OILSTONES frequently slip off the work bench when honing small tools. To prevent this, place a piece of sponge rubber beneath the stone. It is effective regardless of the pressure used on the tool.

Unskilled Labor Creates New Tooling Problems

BY O. W. WINTER, PRESIDENT, THE AMERICAN SOCIETY OF TOOL ENGINEERS

Tooled for the talents and capacities of women workers without previous skill in metal working, this operation on a shell fuze is suited to the days ahead. Thousands of other operations must be similarly tooled to meet the dual threat of increased production schedules and unskilled labor

AS LABOR RESERVOIRS are drained and people of decreasing skill must be put into war industries it becomes necessary to provide equipment that is more nearly automatic. Tooling up for war involves these three stages (1) rehabilitating and applying old equipment, (2) tooling general-purpose equipment, and (3) complete design and tooling of automatic machinery.

To get into production of war goods rapidly the plants that had been making automobiles, refrigerators, furniture, radios and toys had to make the best of what machines they had. They converted, retooled, rebuilt wherever possible and got into production. That was the first stage.

But the demand for greater and still greater production called for more and better machines. So new machines were ordered, built, installed and tooled. New plants were built and old ones altered and enlarged. Workers were trained for new jobs and thousands of new workers were hired. This second stage was reached late in 1942.

We are now at the beginning of the third stage. To supply our armed forces with the able bodied men they need

will bleed our war plants of skilled operators. In their place we must hire women, older men, handicapped workers—we must man our machines with women and men who are unskilled and often feeble workers. And we must get from our machines a record-breaking output of high precision work no matter how unskilled the operators.

There is only one way we can do this. When the operators of machines lack skill, the machines themselves must be given the skill. Nor is skill in the running of a machine the only factor involved. There is also the element of strength. We cannot expect women to lift and haul and jack heavy castings and parts about as men do—or did.

Tool Engineers Must Find the Answer

There lies the problem in full view. The answer will come, must come, from tool engineers working in cooperation with the machine tool builders.

Great strides have already been made. Take the complex job of contour machining as an example. Aircraft and armament parts have complicated profiles that must in many cases be machined all over. Only a couple of years ago these parts would have taxed the skill of most of our best operators with the tools then available. Tool engineers tackled the job and today with standard machine tools plus ingenious tooling we are turning out these parts in adequate quantities and to precise tolerances.

Tool engineers have licked the shortage of metal-cutting tools by ingenious methods of salvage and repair, and by discovering ways to increase tool life. By chromium plating, nitriding and cyaniding they have further extended the productiveness of high-speed steel tools. Carbide and cast-alloy cutting tips have also been developed to this end.

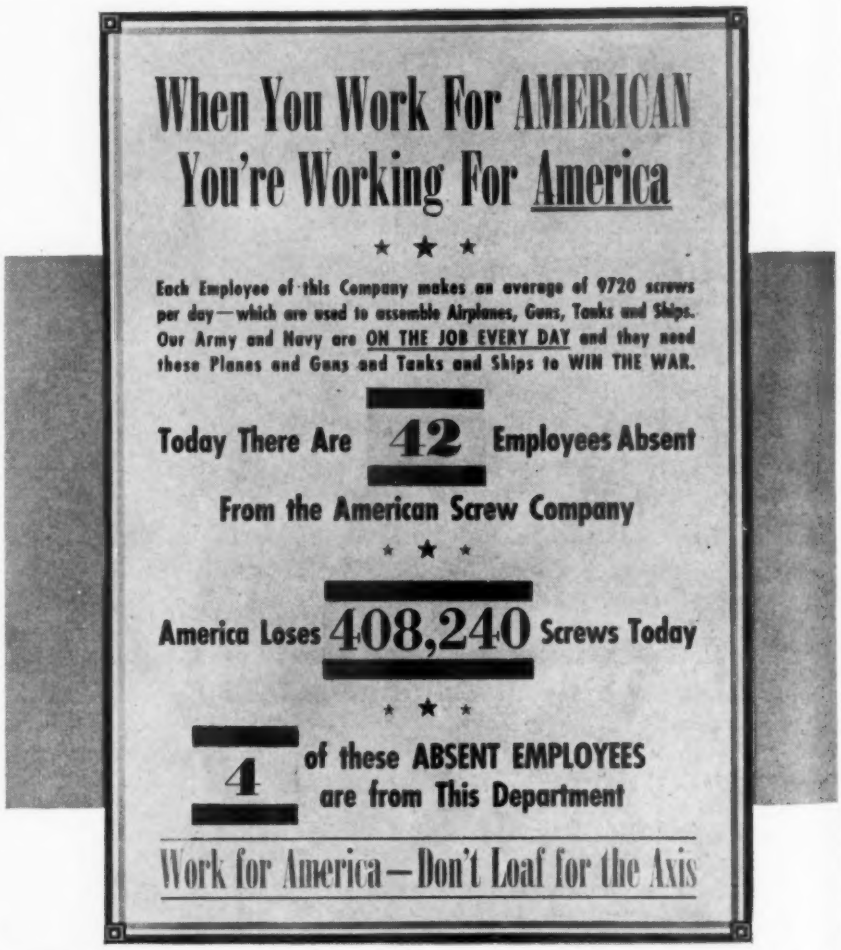
Even in inspection, tool engineers have found ways to transfer the required skill from the operator to the machine or device. Visual inspection equipment can be used as well by the rank novice as by experienced inspectors.

Still the big job lies ahead. It is not enough that tool engineers accomplished the change-over from peacetime production to the making of war products almost over night—a minor miracle in itself. Nor can they rest on their laurels because they have turned corn fields into tank plants and are welding aluminum and machining magnesium. Until they have developed machines and tools, jigs and fixtures that will assure continuous, adequate, accurate production of the materials of war no matter how unskilled the labor—tool engineers cannot rest.

To lick this job the experiences and advances of each must be made available to all. The American Society of Tool Engineers, with its 57 chapters and 12,000 members, serves as an excellent channel for the exchange of such information. It has sponsored the "Tool Engineering Talent Survey"—an optional, confidential list of the skills and experience of tool engineers willing to offer free consulting service to procurement divisions, War Production Board, prime and subcontractors. These consultants have done much fine work, especially with the Ordnance Department. Other A.S.T.E. members have helped greatly with advice on and active participation in the defense training program. An A.S.T.E. committee has collected and reviewed all available tool engineering literature and visual training aids. It is thus in position to make sound recommendations in this field.

The society has recognized its responsibility for passing along the "know-how," especially today when tool engineers throughout the country are faced with such a tremendous task. Its annual meetings have set a pattern of usefulness that will be followed in the coming meeting in Milwaukee, March 25–27. The technical sessions will follow this theme, "Here's How to Know How." And the "Production Front Edition" of the bi-annual "Machine and Tool Progress Exposition" will furnish further valuable information towards the solution of the problems tool engineers now face.

We have, I repeat, passed through only the initial stages of this war production program. As tool engineers the responsibility for success from here on out is largely up to us. We must review our experiences, pool the knowledge we have so far acquired, learn all we can about new processes, techniques, tooling ideas, and go on with this help to solve the problems of meeting increased production schedules and the hiring of much labor of little skill in the months ahead.


When You Work For AMERICAN
You're Working For America
★ ★ ★
Each Employee of this Company makes an average of 9720 screws per day—which are used to assemble Airplanes, Guns, Tanks and Ships. Our Army and Navy are ON THE JOB EVERY DAY and they need these Planes and Guns and Tanks and Ships to WIN THE WAR.
Today There Are 42 Employees Absent
From the American Screw Company
★ ★ ★
America Loses 408,240 Screws Today
★ ★ ★
4 of these ABSENT EMPLOYEES are from This Department
Work for America—Don't Loaf for the Axis

Attendance Booster—Absenteeism has been cut one-half by 14 × 20 in. charts which announce daily absentees in departments and the entire plant of American Screw Co. Absenteeism is interpreted in terms of lost production. Original is red, blue and gold on a white background

War Winning SUGGESTIONS

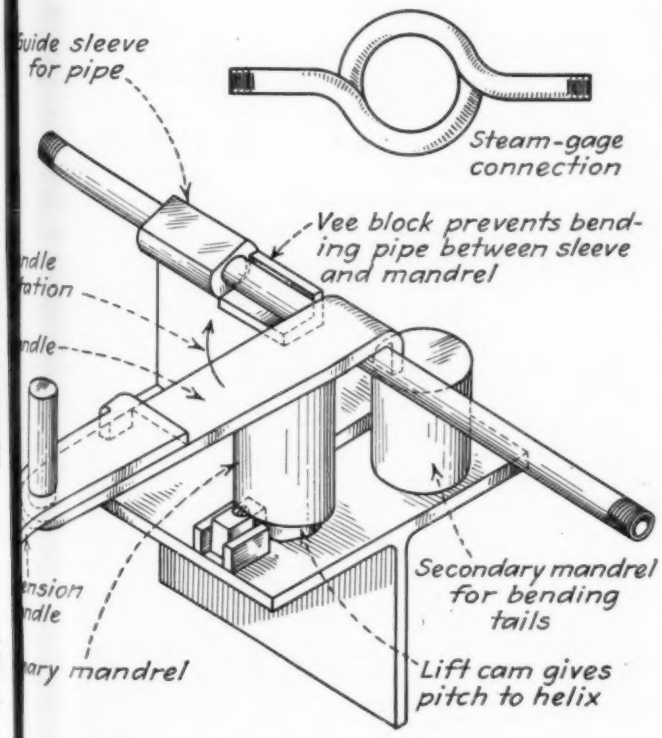
The following ideas were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive. They are freely offered to industry as an aid to its war production.

Jig Makes Circular Pipe Bends

The jig shown in the drawing is used to bend steel or non-ferrous tubing to make circular or so-called "pigtail" connections for steam gages. Prior to using this jig, the tubing was heated and bent around any handy piece of pipe; as a result, smooth circular bends could not be made, and the tubing flattened against the pipe. The tubing may be bent cold in the jig, the job has a finished appearance, and production time is cut considerably.

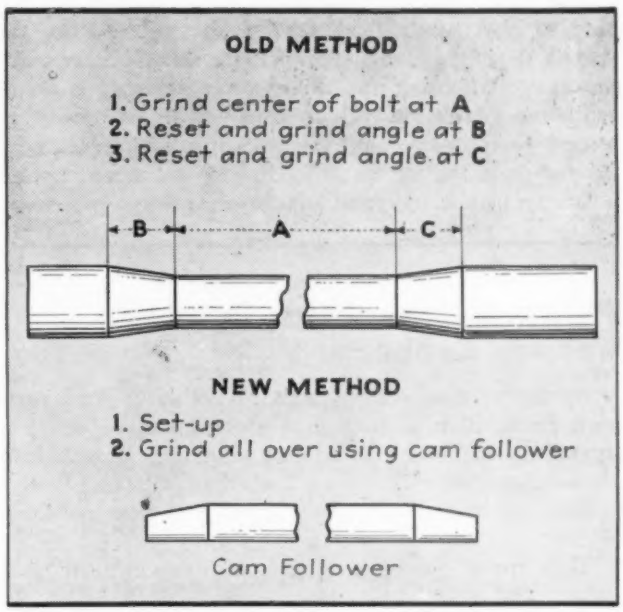
A straight section of tubing is first located in the guide sleeve, passing between the primary mandrel and the end of the bending handle as shown in the drawing. The handle is rotated clockwise, bending the tubing around the primary mandrel—as bending progresses, this mandrel is lowered on a cam, thus producing the proper pitch for the 360-deg. bend. After this bend is completed, the end of the tubing is bent backwards against the secondary mandrel.

The old method of making these steam-gage connections required from 20 to 25 min. They are now made in this jig in 5 min. without spoilage. The one jig produces 200 connections a day, which is sufficient to supply the demands of three shipyards. *Suggested by Harry H. Carney, Richmond Shipyard No. 1, Permanente Metals Corporation.*


Guide sleeve for pipe
Steam-gage connection
Vee block prevents bending pipe between sleeve and mandrel
Secondary mandrel for bending tails
Lift cam gives pitch to helix

Production Increased 400 Percent

Grinding crankcase bearing bolts for a high-speed marine engine on one type centerless grinder required three separate operations as shown on the drawing: (1) Set up and grind center section, (2) set up and grind one angle face, and (3) set up and grind a second angle face. By setting the job up on a Cincinnati centerless grinder and using a cam follower to guide the wheel, all work is now done in one set-up.



Production by the old method was 7 parts per man-hour. This was increased to 30 parts per man-hour by the new arrangement. *Suggested by Joseph Boucher and Joseph H. Chubran, Marine Engine Division, Packard Motor Car Company.*

Fabric-Based Nailing Strips Easily Removed

Nailing strips holding plywood plane parts while glue dries can be quickly removed if first laid on fabric lacing

In the fabrication of the fuselage and center section of the Beech AT-10 trainer plane, glue is applied to parts of the subassemblies and these are held in place by nailing strips while the glue dries. The nailing strips are used to apply pressure to glue joints over curved surfaces that are too large for ordinary glue clamps. After drying, the nailing strips must be removed without damaging the skin surface. This is difficult since such strips split easily by placing ⅛ x ½-in. untreated hammer to slip. Any damage resulting to the skin must be reworked by the personnel removing the strips in the final assembly department.

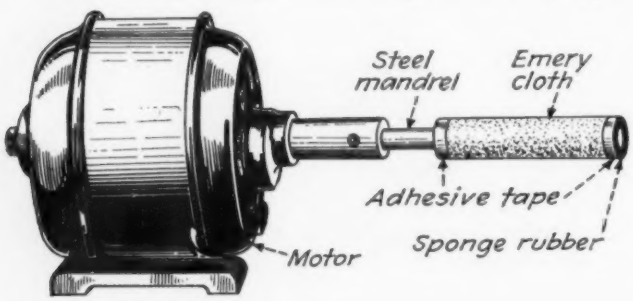
Such nailing strips can be removed easily by placing ⅛×½-in. untreated hood lacing between the subassembly and the strips—the life of the lacing can be quadrupled by impregnating it with 5106 Fairprene cement.

The hood lacing is laid out in as long strips as practical, after which the nailing strips are started. Then the glue is applied to the skin, fuselage bulkheads, center-section ribs, or whatever assembly is being fabricated. After the nailing strips are driven down, the assembly is set aside until the glue dries. When dry, the protruding end of the fabric hood lacing is wrapped around a hammer handle and given a yank—the nailing strip comes off at a rapid rate. If the hood lacing has been applied properly, row after row of the nailing strips can be removed in a few minutes. This practice has reduced by 50 percent the man-hours required for this work; furthermore, it has saved 25 percent of the time previously required to rework damaged skin surfaces. *Suggested by C. E. Bryant, Beech Aircraft Corporation.*

Polishing Wheel Has Base of Sponge Rubber

Instead of the usual methods of polishing small parts with emery cloth, the strips of abrasive can be wrapped around sponge rubber placed on a solid steel core and held thereon with adhesive tape. The arbor is mounted on a motor used to operate burring, lapping or cloth polishing wheels.

This type of polishing wheel is adaptable to many types of work. It has been found especially advantageous for polishing small parts having blended cuts and round corners on irregular surfaces. Estimated savings through its use is $3,000 annually. *Suggested by Floyd Crouse, International Business Machines Corporation.*

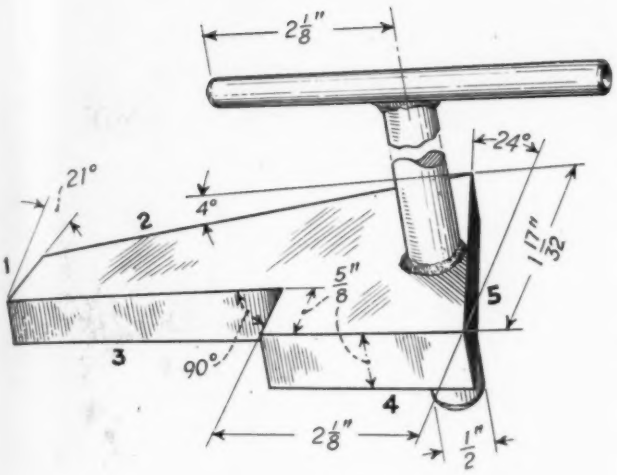


Stop for Multiple Tube Bends

When making five bends in small tubing it was necessary to use a 5-in. length of ⅜-in. rod inserted in various holes drilled at correct locations on a bending plate. The rod was placed in five different positions before the part was completed. This method was abandoned when the illustrated tool was designed. It is made of flat tool steel, hardened to 50-52 Rockwell C, to which is welded a ½-in. centering pin made of drill rod. A handle is welded to this pin so that the tool can be swiveled easily.

When in use, this tool or stop is placed in only one hole of the bending plate, and by a single twist it is turned into

SUGGESTIONS ★ ★ ★



position for any angle bend needed on the job. This eliminated numerous handling operations of the old method and increased production on the part in question. The locations on the tool for the required bends are numbered from one to five in the order of the bends made. Since this suggestion was made, it has been adopted on two other bending jobs. It has resulted in a production increase of 5 percent. *Suggested by John Ferguson, Wolverine Tube Division, Calumet & Hecla Consolidated Copper Company.*

Stops Manual Handling of Batteries

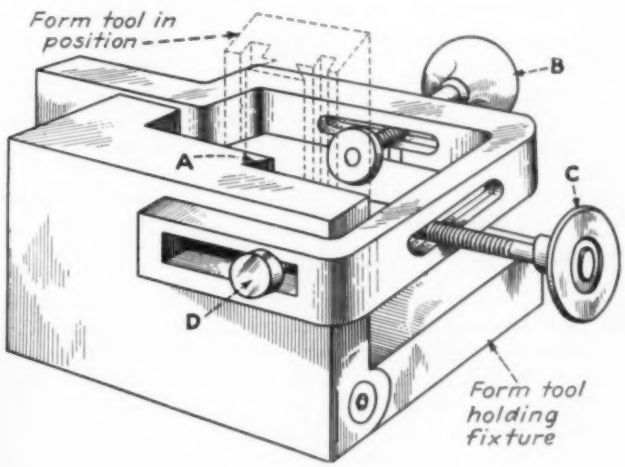
At a plant making Army trucks, batteries received from the manufacturer were shipped loose in box cars. On arrival they were unloaded by hand and placed in tote boxes where they were taken by motorized industrial trucks to the battery storage. They were unloaded from the tote boxes and piled on the floor. When production needed batteries, they were taken from storage, piled in tote boxes by hand, and moved to the line by motorized trucks, making a total of four times that they were lifted by hand.

It was suggested that the batteries when shipped from the manufacturer be loaded on pallets or skids with three 4×4-in. wooden runners to hold them off the floor for handling by fork trucks. Ten batteries can be loaded on the pallet and surrounded by a wooden frame with stakes at each corner to fit into the pallet, thereby preventing the frame from slipping. Then three more rows of batteries, each surrounded by a similar wooden frame, can be loaded on top of the first row, making four rows on each pallet, or a total of 40 batteries.

Stacks of batteries can be loaded in the box car at the manufacturer's plant, using fork trucks. Such trucks can unload them at their destination, take them to storage, and when needed to the production line. This not only increases handling efficiency, but also reduces by one-half the storage space required. *Suggested by Benjamin D. Wright, Yellow Truck & Coach Manufacturing Company.*

Grinds Form Tools Accurately

When grinding form tools by hand, they are set up on angle plates, working from the bottom face of the tool which is not necessarily a true face. When set up, the tool is anchored with C-clamps. Very often the tool is 0.001 or



0.002 in. off square with the dovetail, causing the resultant cut on the tool to be off square a corresponding amount. By designing the illustrated holding fixture, the tool can be set up quickly at the proper angle for grinding with the definite assurance that it will remain in that position.

The tool is squared at the dovetail, the fixture being machined at *A* to be a matching fit between the tool and the fixture. Screw clamps *B, C* and *D* hold the tool in place. The life of the tool is increased by accurate grinding and machine scrapping of parts reduced. A saving of 66 percent is realized in set-up time. *Suggested by Earl A. Krackow, Aircraft Engine Division, Packard Motor Company.*

The Finances of Wartime Tooling

The American machine industry has won its initial battle of the war. RFC pool orders and DPC expansion programs have given us the tools to make weapons to beat the Axis

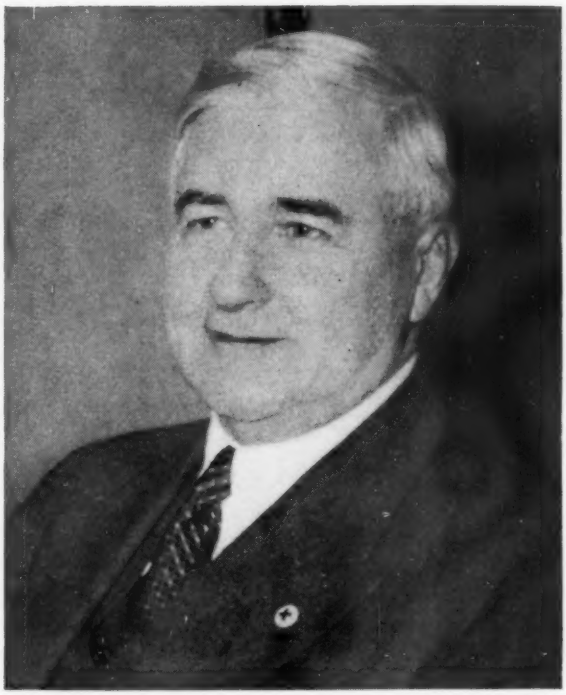


Photo by Harris & Ewing

By JESSE H. JONES
Secretary of Commerce

PRESIDENT ROOSEVELT, in his message on the state of the Union, stirred the nation's pride and dismayed our enemies, when he revealed that in 1942 we had produced 48,000 military planes, 56,000 combat vehicles, and 670,000 machine guns.

These figures represented a production miracle; a conversion feat that had seemed impossible when it was first proposed and that would have been impossible but for machine tools and other precision instruments.

Machine Tools Were Not on Hand

Mass production and precision have become bywords in American industry; so much so, in fact, that those without actual experience on assembly lines often failed to realize that—but for machine tools—industry would still be dependent upon custom-built products; and that only hundreds, instead of thousands and hundreds of thousands, of finished articles would constitute our annual production.

Nor did we have available, at the beginning of the defense effort, the machine tool equipment necessary for the job we had to do. We would not have had it in time if government, through the RFC subsidiary, Defense Plant Corporation, had not joined hands with industry to accomplish the task.

In January, 1940, net machine tools in place approximated 1,323,131, according to AMERICAN MACHINIST. The Axis powers, which had been tooling up for war over a period of years, had more machine tools specifically designed for the production of armament than we did.

We, therefore, started at a disadvantage in a race that became desperate in December, 1941. But, in the four years, 1939 to 1942 inclusive, more machine tools were built than in the preceding twenty years.

Some idea of what has been accomplished may be gained from the following tabulation from AMERICAN MACHINIST of the annual value of machine tool production:

1937.....	$189,000,000
1938.....	140,000,000
1939.....	200,000,000
1940.....	442,000,000
1941.....	775,000,000
1942.....	1,360,000,000

Although mass production could not exist without machine tools, cutting tools and gages, these products themselves are not susceptible to mass production. Precision instruments of any sort require skilled labor, much hand work, and a great deal of time to produce.

The manufacturers of precision tools have worked in comparatively small units. It had never been possible for them to accumulate large inventories of finished goods. Most of their output was on order. The percentage of working capital necessary was high in comparison to the needs of producers who dealt in articles subject to quick turnover. A machine tool, moreover, is built to last and the average customer is not a replacement prospect every year.

Obviously, the machine tool producers of the United States were not in a position to finance an expansion, which it was estimated would run into more than $2,500,000,000, without some form of help.

It was equally apparent that the expansion was necessary for the defense and war effort.

It was into this situation that the Defense Plant Corporation, RFC's subsidiary, stepped in 1940, through the establishment of pool orders for machine tools, cutting tools, and gages, which assured the manufacturers of a market for all the tools they could produce in advance of the actual requirements of manufacturers.

Pool Orders Saved Plant Delays

It was believed that unnecessary delays could be avoided if such machinery and equipment could be manufactured before the war plant in which it would ultimately be used had even

been planned specifically. In this way, too, difficult peak demands would be avoided and a minimum of facilities could be kept operating for a maximum period of time for necessary machinery and equipment.

The RFC's contribution to this program may be judged by the fact that orders totaling $1,542,920,302.07 have been placed in all pools; that financial arrangements have been made with 165 manufacturers of machine tools for plant expansion and improvements totaling $83,290,000; and that 250,000 tools of all sorts have been produced for the pools.

There has been a wide variation in the dollar amount of the RFC orders. The largest order was placed with an Ohio concern for $28,999,884, the smallest with a New York concern for $721.99.

RFC advances for plant construction have ranged from $4,950,000 to $25,000.

Some orders have only one type and one size machine; others call for many types and sizes. For example, an order has been placed with a Michigan concern for 159 types and sizes of machines. The number of machines in each group range from 5 to 11,000.

Officials of the Office of Production Management first discussed this problem with officers of RFC. It was decided that this corporation would place orders with the companies, and the directors authorized $35,000,000 for this purpose.

Subsequently, a second order pool was created for machine tools to take care of the bomber program, and a total of $200,000,000 was allocated to it.

1½ Billions Authorized

As time went on, it was found necessary to consolidate these two pools. The authorization for the regular machine tool pool has since been increased from the original $35,000,000 to $1,500,000,000.

The purchase contract between the machine tool builder and RFC's Defense Plant Corporation originally required that, as orders were received from others, Defense Plant Corporation would be released from its liability. Subsequently, this provision was changed and now on most of the outstanding orders DPC is not released from its liability until the date the machines are invoiced or shipped, whichever is earlier.

As machine tool builders got into production, it was found that they did not have the necessary working capital to carry on and in December, 1941, it was agreed that upon the request of the machine tool builder, RFC's Defense Plant Corporation would make advances not to exceed 30 percent of the purchase order placed. These advances were to be repaid as orders were received from industrial concerns. This would mean that the industrial concern would be required to make a 30 percent advance with its order. The machine tool industry found that it was not possible to obtain a 30 percent down payment on many of its orders. Defense Plant Corporation then agreed that the advance need not be returned until the machines are invoiced or shipped to others.

To the present time, orders have been placed with 257 concerns, totaling $1,457,613,302.07. Advances have been made on these orders to 176 concerns, totaling $302,109,346.67. Of the latter amount $107,598,263.58 had been repaid by December 1, 1942.

Most Stored Machines Sold

When machines are completed and the manufacturer has been unable to sell them to others, the purchase contract provides that Defense Plant Corporation will pay for them and place them in storage. To the present time, the corporation has purchased machines with a total value of $5,666,371.75. However, machines with a value of $4,308,756.33 have been sold from storage, leaving $1,201,217.77 of machines still in storage.

Until recently, the amount of orders being placed from month to month exceeded the releases. It is believed that from now on the opposite will be true, because now many machines are being completed and will be shipped within the next few months. This will cut RFC's Defense Plant Corporation's contingent liability and also will restore the advances heretofore made.

As time went on, it was found that gage and cutting tool manufacturers were having a problem similar to that of machine tool builders. In order to take care of these manufacturers, DPC directors authorized $50,000,000 for orders to be placed for gages and $180,000,000 for cutting tool orders. It was agreed that, upon request, a 30 percent advance would be made.

To the present time, we have placed orders with 36 manufacturers of gages, totaling $10,806,000. Advances have been made to 16 of these concerns, amounting to $2,415,000. On the cutting orders, there have been 28 orders placed, totaling $74,501,000, and advances have been made to 21 of these concerns, totaling $19,297,000.

The gage and cutting tool orders differ from those of the regular machine tool pool in that they are given to cover the manufacturers' estimated production over a specific period. Orders are placed for estimated production of from two to six months and these orders are automatically increased each month by the amount of shipments made during the previous month. In other words, the order remains constant and will not change until RFC's Defense Plant Corporation cancels its.

Of the orders totaling $1,542,920,302.07 placed in all pools, releases and machinery purchased total $705,908,063.35, which leaves a net liability as of December 1 of $837,012,233.72. Defense Plant Corporation has advanced $302,109,346.67 on these orders.

Producers of machine tools, when the pressure under which they are working on war orders permits, must wonder what the post-war picture in their industry will be like. We will then have a larger reservoir of machine tools and precision instruments than ever in our history.

What are we going to do with them?

It is my belief that there will be several avenues of utilization open.

First of all, we must remember that there will be a tremendous reconstruction period all over the world. Every nation on the globe will be called upon to replace the material damage of war. Tools will be needed, possibly in even greater numbers than those which we now possess. Foreign markets are sure to be active and any surplus which we may have in this country will be in great demand.

Needs of Re-Conversion

We must think also of the period of conversion from war to peace in the United States. The available supply of tools surely will serve as a stop-gap during that period. Hundreds of precision instruments can be utilized just as well for civilian production as for the making of armament. The change-over in many instances will be relatively small and require little time.

In addition, we will need to replace many specialty tools of the type we have had to scrap to go into war production. It is reasonable to suppose that the machine tool industry will, in this field, have a back-log of unfilled demand of considerable proportions.

Economic experts are in apparent agreement that, after the war, the United States must have a high level of production, in order to maintain employment and prevent a period of depression. We cannot do this without mass production and mass production needs precision instruments.

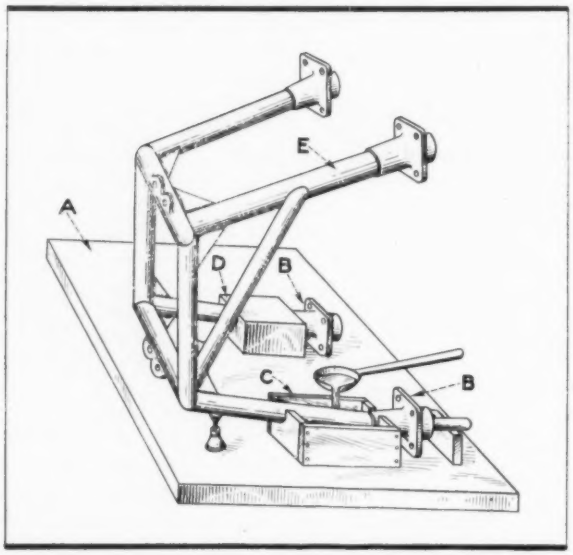
The tool builders of the country deserve high praise for what they have done and need not, in my opinion, look forward with too much anxiety to their place in the industrial picture of the future.

IDEAS FROM PRACTICAL MEN

Machining Tubular Airplane Assembly Jigs

BY F. W. FROMM

We wished to machine the faces on the attaching points of two large welded tubular airplane assembly jigs, one of which is shown in the drawing. Since there were only two parts, we could not build elaborate fixtures. The jigs are approximately 4 ft. square and 5 ft. high, and the work had to be done on a No. 3 milling machine. This presented a difficult set-up



Irregular shaped tubular parts can be held rigidly for machining. Hold-down clamps are set on special alloy blocks of low-melting temperatures which are poured around the tubular sections for each set-up on the milling machine table

problem. It was solved by leveling the jig up on a surface plate, and pouring hold-down blocks around two of the tubular legs.

The assembly *E* was set up on a surface plate *A* in the correct position for machining. Then the box or mold *C* was placed around the tubular legs as close as possible to the fittings *B*, which were to be machined. All gaps between the ends of the box and the part were filled in with clay, then the box was poured full of Cerro Bend. After the Cerro Bend hardened, the jig was set up on the milling machine and lined up parallel with the table. Hold-down clamps were then placed directly on the Cerro Bend blocks *D*. Since Cerro Bend has a melting point of about 180 deg., it was melted off with boiling water after the machining was completed.

This method avoided the use of expensive fixtures on this particular job, and has since been used where a limited number of irregular-shaped parts have to be machined. It works particularly well on tubular jigs used in the fabrication of aircraft subassemblies, since the jigs can be held absolutely rigid without distorting or bending the tubular section. This method has also been used to machine light castings, because it eliminates chatter and holds the part firmly during all machining operations.

High-Speed Super-Sensitive Drill Press

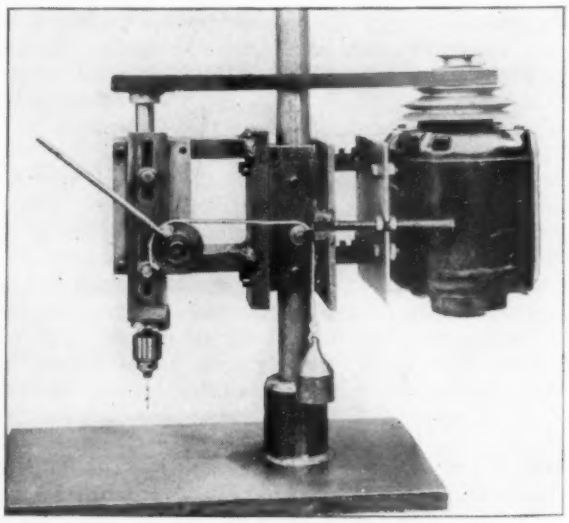
BY C. T. PACKER

Westinghouse Electric & Manufacturing Co.

The illustrated high-speed drill press has proved satisfactory for accurately locating and drilling very small holes. This drilling unit is adjustable on the column for any drilling height desired, and has a speed range from 3,000 to 7,500 rpm. A single V-pulley is used on the spindle and is adjustable to meet the required alignment of the cone pulley on the motor shaft. The motor base is hinge mounted for the belt adjustment.

The construction includes a main spindle mounted in two ball bearings and a chuck spindle mounted in the center of the main spindle. There is a $\frac{3}{4}$ in. hole 5 in. deep in the main spindle for the chuck spindle. A slot 2 in. long and $\frac{9}{64}$ in. wide is cut through the center for the cross driving pin.

The chuck spindle has a taper on the lower end to fit a No. 1 Jacobs chuck. Just above the chuck a No. 200 sealed ball bearing is mounted to take the feed lever thrust. Above the ball bearing is a bronze



This super-sensitive drill press, used to locate and drill small holes accurately, has a speed range of 3,000 to 7,500 r.p.m.

bearing having a $\frac{13}{32}$ in. hole $\frac{3}{4}$ in. long and a diameter to fit the lower end of the main spindle. Another bronze bearing is fitted on the top end of the chuck spindle and a slide fits in the $\frac{3}{4}$ in. hole in the main spindle. A compression spring with sufficient tension to support the chuck shaft and chuck is located around the shaft between the bearings. A $\frac{1}{8}$ in. diameter pin 1 in. long passes through the top bearing and chuck shaft and into the driving slot of the main spindle at assembly. The bottom bearing is held in the lower end of the main spindle by a setscrew.

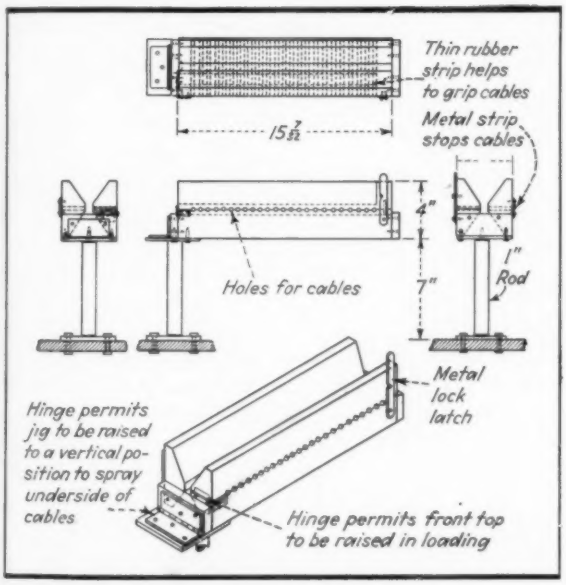
The rack and pinion feed mechanism is shown in the illustration. These parts have been counterweighted and add to the sensitivity of the unit. This drilling unit effected a 25 percent increase in production and a decrease in drill breakage.

Cable Code Jig Saves Time

BY JOSEPH WILDNER

Nashville Division, Vultee Aircraft Incorporated

In many cases electric cables are identified by spraying with paint at one or both ends. Originally this operation was carried out by spraying the cable ends individually with the cable held by hand while painting. By using the jig block shown, 25 cables are


Thin rubber strip helps to grip cables
15 7/32
Metal strip stops cables
4"
1" Rod
Holes for cables
7"
Metal lock latch
Hinge permits jig to be raised to a vertical position to spray underside of cables
Hinge permits front top to be raised in loading

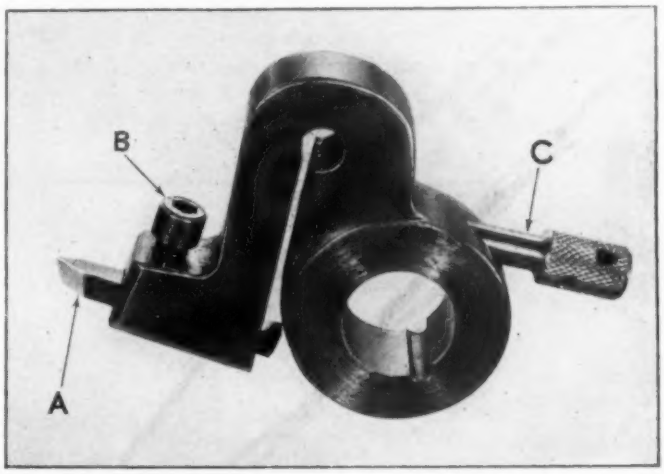
With this code painting jig, 25 cables can be spray-painted in the time formerly required to paint the end of one cable

sprayed on one side simultaneously, then the block is raised to a vertical position so that the underside of the 25 cables may be sprayed. The channel between the two sections of the jig provides a code band of uniform width. Diameters of the clamping holes may be varied to take care of various sizes of cables. A thin strip of rubber under the hinged clamp helps to grip the cables tightly in the holes and prevents slipping while the cables are being painted.

Tool Cuts Line Graduations on Scales

BY CHARLES HATTENBERGER

There are numerous occasions when the machinist or toolmaker is required to make special dials, scales or line markings. This is done usually on the milling machine, using a toolbit ground to a sharp Vee edge and clamped between two collars on the arbor. The lines comprising the graduations are then "planed" to the proper depth and spacing. This procedure does not always cut the lines smooth and uniform.



This spring toolholder, mounted in the arbor of a milling machine, will cut smooth and uniform graduation lines on scales

To eliminate this difficulty, I devised the illustrated toolholder that works on the principle of a lathe spring toolholder. It is made from ordinary cold-rolled steel, carburized and hardened. The large hole with the keyway is clamped on a standard 1-in. milling machine arbor. Cutting tool *A* is secured by means of screw *B*. The amount of spring movement is limited by means of screw *C*, which is shown retracted to permit the full amount of tool movement. Among the advantages claimed for this tool is the cutting of smooth, clear and uniform lines.

Cutting Left-Hand Threads Accurately

BY EDWARD N. OLSON

The accepted way to cut left-hand threads in the engine lathe is to have the carriage travel toward the tailstock; such threads, however, can be chased traveling toward the headstock. This is done by revolving the spindle backwards and setting the threading tool upside down. There are three advantages in chasing left-hand threads this way:

1. There will be less chatter in the thread due to the pull-down action of the cutting tool on the work—it helps to keep the spindle bearings on the lower half of the headstock.

2. There is no need for an undercut at the start

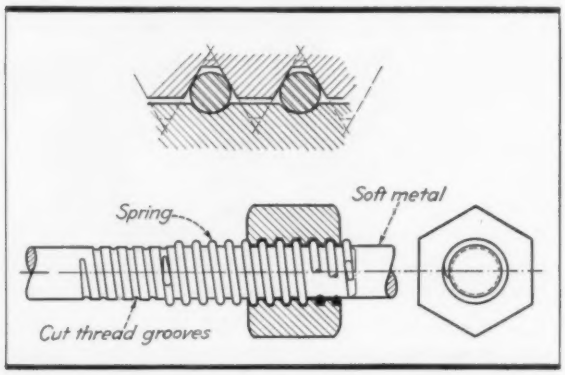
of the thread, which by the other method weakens the shaft being threaded.

3. Better control of thread depth and size can be exercised. When starting a left-hand thread from the tailstock, a ring gage can be used to check the first two or three threads. When cut in the conventional manner, the full length of left-hand threads must be run before the ring gage can be used.

Spring Threads for Soft Material

BY CAPTAIN BROOKS WALKER

As a rule it is not feasible to cut threads in very soft metals and other soft materials. Yet threading of such parts would often be a welcome convenience if the threads were of sufficient strength. As a means



When it is not feasible to thread soft metal, and yet threads are desired, the part can be cut with a round-nosed tool and spring wire wound thereon

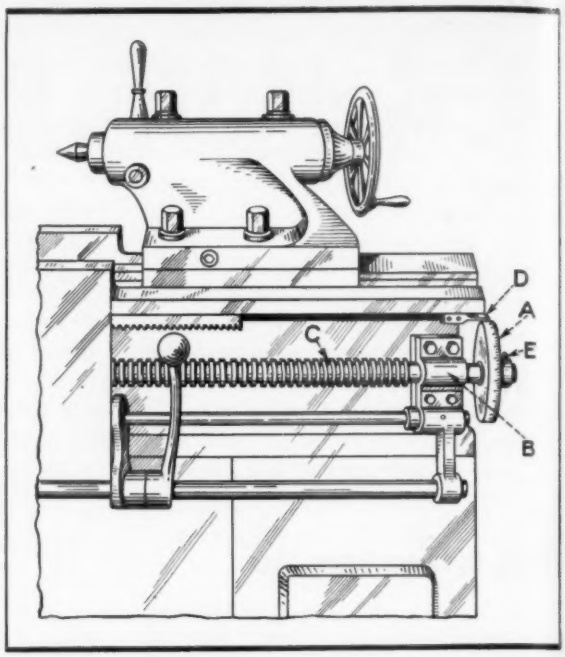
toward this end, the soft metal can be threaded with a round-nosed tool for the correct pitch and to sufficient depth to retain a spring wound in the shallow thread. The diameter of the spring wire must be determined to maintain the proper thread height.

Lathe Carriage Set Quickly With Dial

BY OSCAR CRAFT

On lathes not equipped with micrometer carriage stops, considerable time can be consumed in setting the carriage accurately for cutting grooves, locating shoulders, or facing cuts. Some three years ago I fitted a graduated handwheel on the leadscrew of a lathe in our shop to make it easier to locate the carriage longitudinally along the ways for such cuts.

As shown in the accompanying sketch, a 10-in. diameter handwheel *A* was fitted on the section of the leadscrew extension which projected through the outboard bearing *B* at the rear end of the lathe. The leadscrew *C* has a pitch of four threads per inch, so 250 equally spaced divisions were marked around the circumference of the handwheel. Thus, the carriage is advanced 0.001 in. when the handwheel is turned sufficiently to advance from one mark to the next



By fitting a graduated handwheel to the end of the leadscrew on a lathe, it is possible to move the lathe carriage accurately along the ways for locating grooves or shoulder lengths, locating counterboring tools, or resetting facing tools

under the pointer *D* welded to the end of the lathe bed. A setscrew *E* is provided in the hub of the handwheel to permit setting the wheel to zero.

When it is desired to move the carriage accurately from one position to the next, the split nut is closed and backlash is taken up by turning the handwheel slowly until the leadscrew threads come in contact with the threads in the split nut. The handwheel then is set to zero under the pointer and the setscrew is tightened. Then, by turning the handwheel slowly by hand the lathe operator can move the carriage accurately to the desired position. Depending on the accuracy of the leadscrew, the carriage can be positioned within 0.0005 in. or less if the leadscrew threads are cleaned carefully.

A Use for Broken Center Drills

BY H. R. HAGEMAN

Centering tools commonly used for preparing work to be held between centers in the lathe or milling machine are also frequently used to start a drill in indicated work on the faceplate. When thus used, the pilot drill is liable to break off, especially if the drill chuck is slightly out of line.

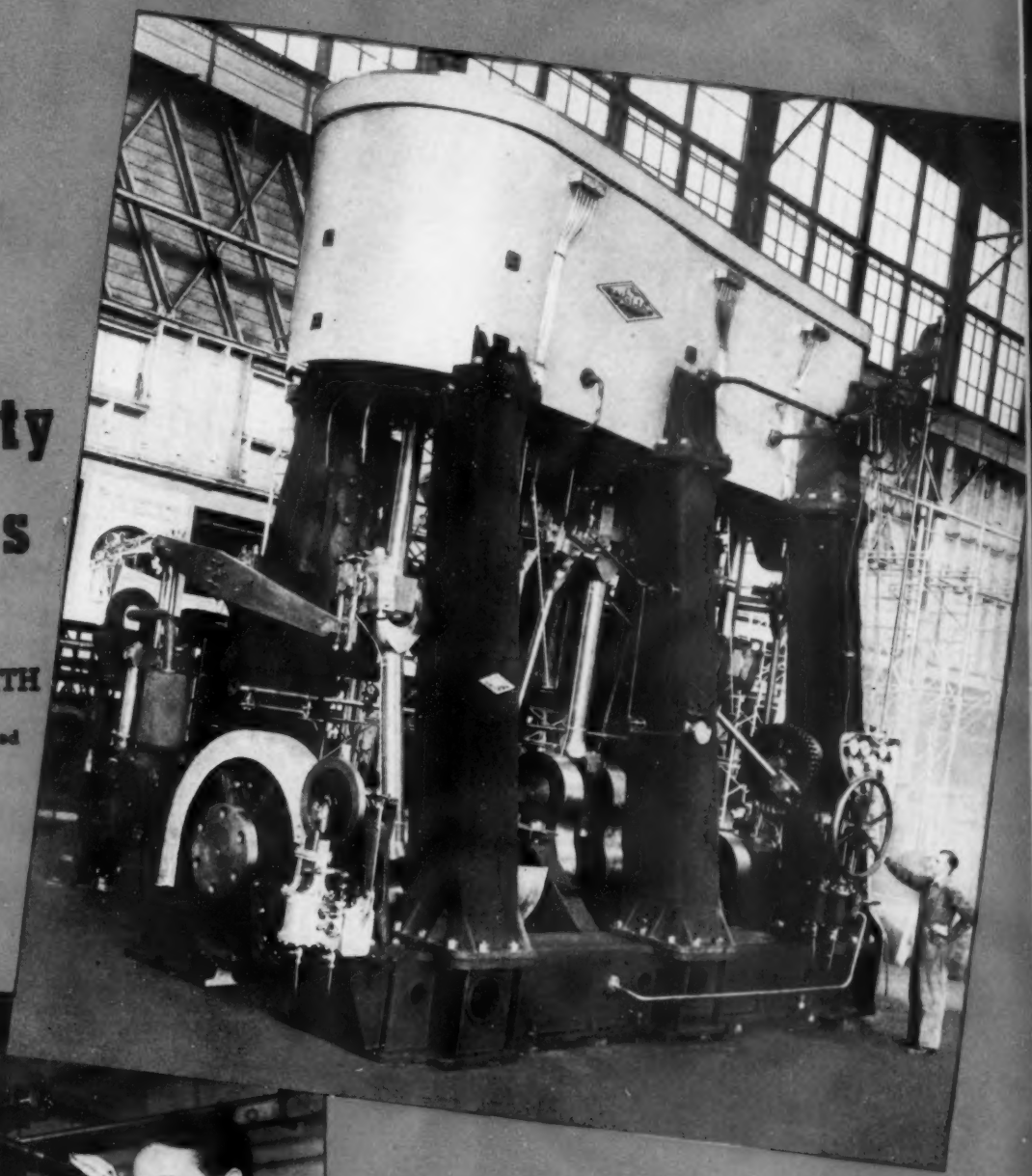
The writer has found that if the remaining 60-deg. section is pointed to about 80 deg., and back only as far as necessary to sharpen it, the tool will work as well as before it was broken for faceplate work, and can be used instead of the whole center drill. When resharpened to 80 deg., it can be used as described without fear of breaking.

Armament

SECTION OF AMERICAN MACHINIST

Canadian Engines For Liberty Freighters

BY A. L. AINSWORTH
Vice-President,
John Inglis Company, Limited



Also Boys Anti-Tank Guns—Made in Canada

CANADIAN ENGINES FOR LIBERTY FREIGHTERS

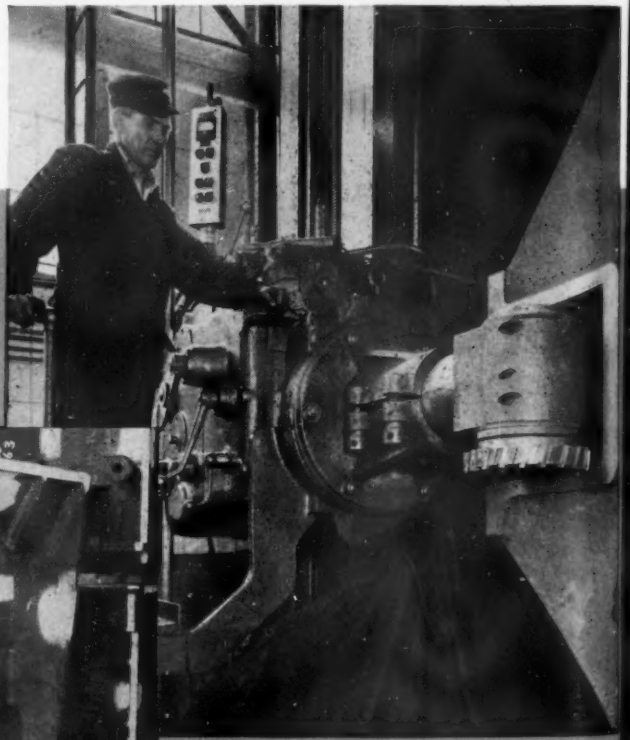
A NUMBER OF COMPANIES in Canada and the United States today are manufacturing triple-expansion type vertical marine steam engine engines to power the Liberty ships that will carry cargoes of munitions and other supplies to the fighting forces of the United Nations. Developing about 2,500 indicated horsepower at 76 r.p.m., each of these engines weighs about 271,000 lb. Piston stroke is 48 in., and the three cylinders measure 24½, 37 and 70 in. in diameter.

Having had a wide variety of manufacturing experience since its organization in 1858, and more especially since its reorganization in 1936, in the construction of a wide variety of steam engines, boilers, hydraulic presses, mining machinery, and other heavy equipment, the John Inglis Company, Limited, had available the needed heavy-duty machine tool equipment and skilled mechanics which made it possible to get into production quickly on these engines once the contracts were let. Even so, these are the largest engines ever made in the company's shops, and a number of improvizations have been necessary in order to increase the capacity of certain of the machine tools to permit finishing some of the large castings.

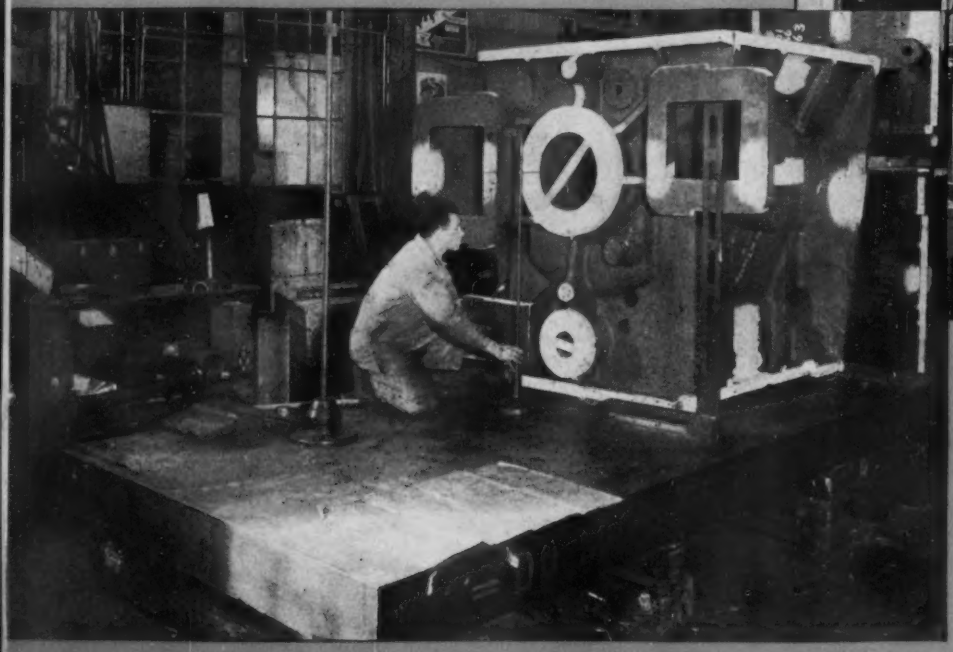
Bedplates, cylinders, columns, valves, and a number of other parts for these engines are molybdenum iron castings. Like the crankshaft, connecting rods, pistons and piston rods, as well as the valve gear members, these castings must be machined within tolerances of 0.002 to 0.003 in. in order to reduce fitting time on the assembly floor. The extensive use of Rexalloy and carbide tool tips in the machine shop has materially decreased the time required for machining most of these castings. For example, the time required for boring the low pressure cylinder has been reduced at least 50 percent by using Rexalloy tool tips in place of high-speed steel tips.

All of the castings for these engines, except the large one-piece bedplate castings, go to a layout table soon after they are received from the foundry. Here, surfaces to be machined are laid out with height gages, large squares, straight edges and scribers both to inspect the casting and make sure that it will clean up in machining, and to provide base lines to assist the machine operators in setting up the castings for the various operations which follow.

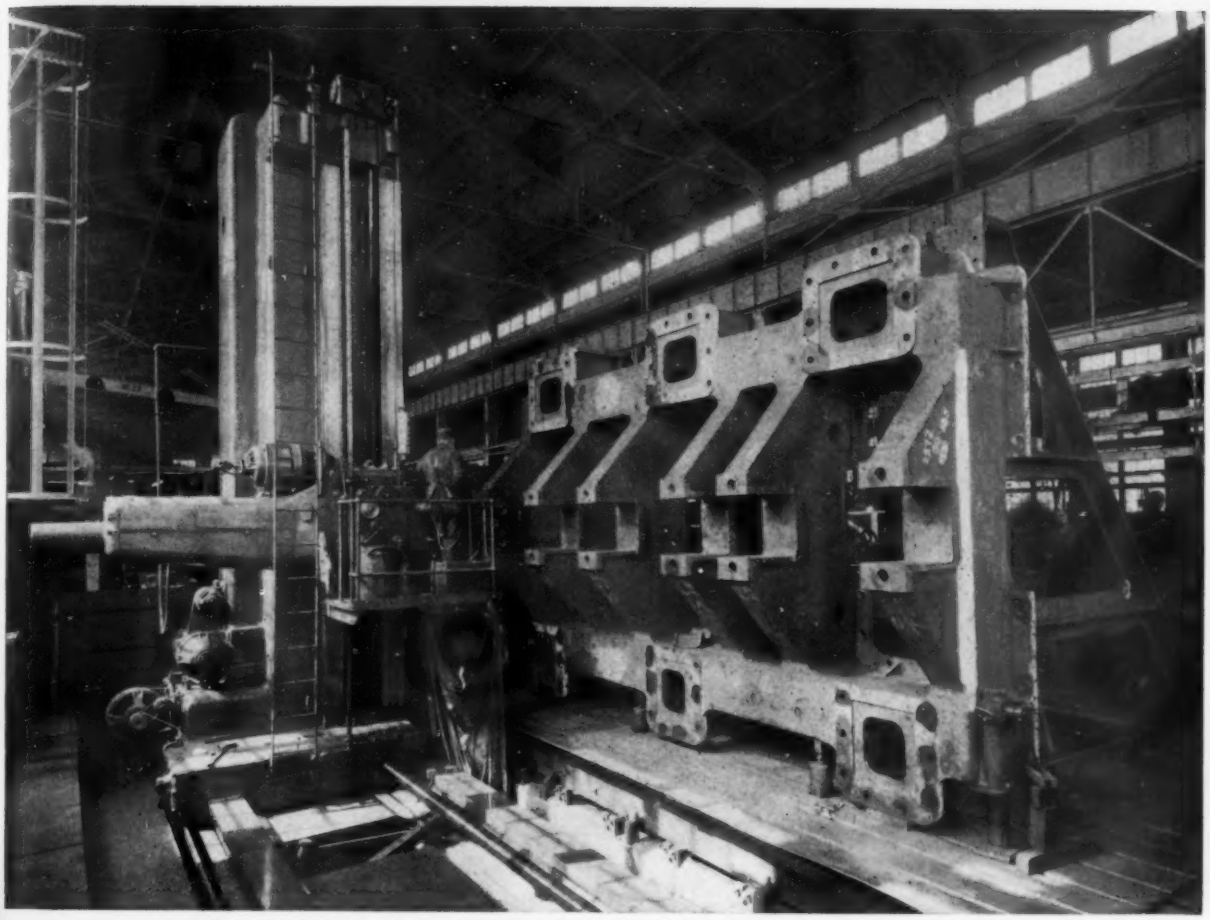
The large bedplate castings which weight nearly 25 tons, are much too large for the layout table. These castings are set up on a floorplate beside a traveling column type Sellers horizontal mill and checked, layed out and then machined without further handling. The casting first is set on its side with the bottom surface toward the machine, in order that clean-up cut may be taken off all the bottom surfaces. For this operation the casting is adjusted on the floorplate so that as light a cut as possible need be taken in order to clean up all of the bottom surfaces. The casting is supported



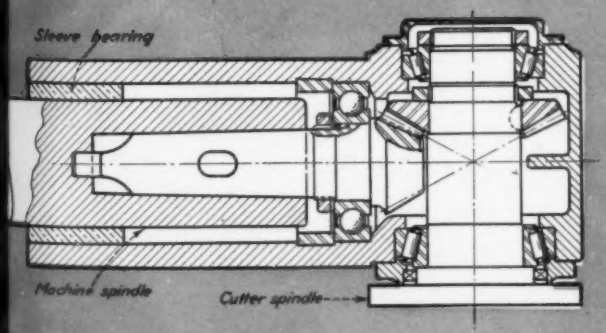
Each casting except the one-piece bedplate casting for one of the 2,500 hp. marine engines goes to a layout table for inspection and for the scribing of gage lines which will assist in setting up the casting for machining operations



A special right-angle milling head is fitted to the spindle of the horizontal mill in order to machine the crankshaft bearing pads in the bedplate. This head can be rotated 360 deg. around the axis of the machine spindle, and when in position is locked by the two clamp bolts shown



A large floor-type Sellers horizontal mill with a 6-in. spindle, is employed for most of the machining operations on bedplate castings. Miscellaneous drilling and tapping operations later are performed by a Baush 8-ft. radial drill. The 25-ton bedplate casting is 19½ ft. long, 12½ ft. wide and about 4 ft. high when in its normal position

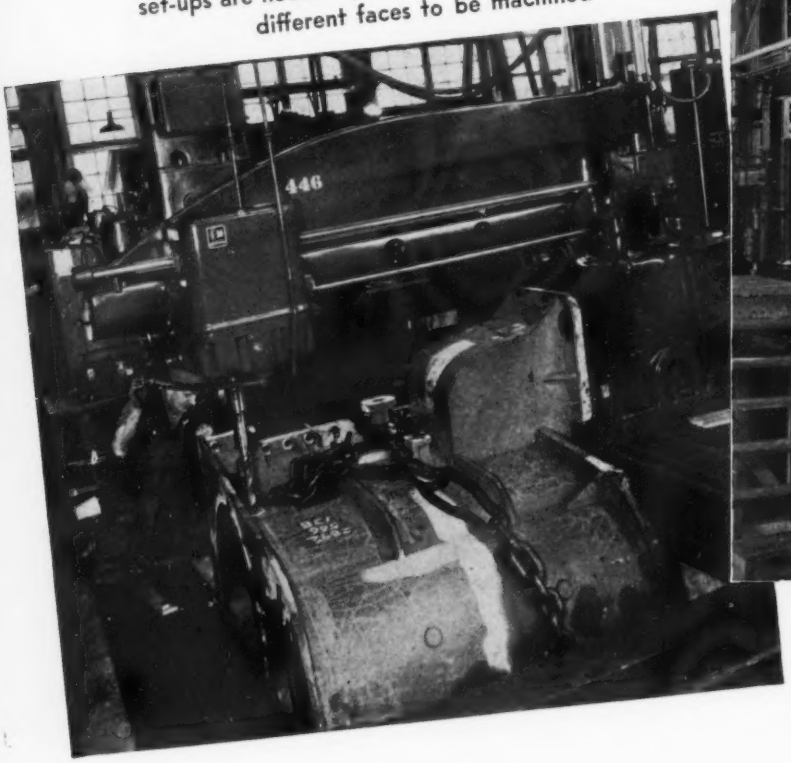


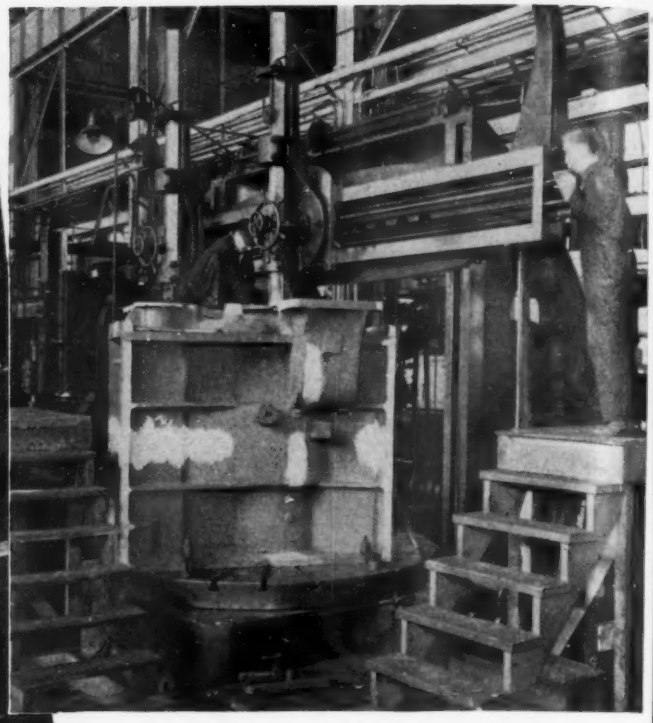
The right-angle milling attachment drives the milling cutter through bevel gears. Preloaded taper roller bearings at the top and bottom of the housing support the short cutter spindle

against angle braces which have 12×12-ft. legs and which are securely clamped to the floorplate in front of the floor-type mill. A 12-in. diameter inserted-tooth face mill having Rexalloy bits is mounted on the 6-in. diameter spindle of the machine and operated at about 15–20 r.p.m. with a 10-in. feed for these cuts. Because of the nature of the casting, the cutting speed and feed must be reduced materially at times in order to reduce chatter.

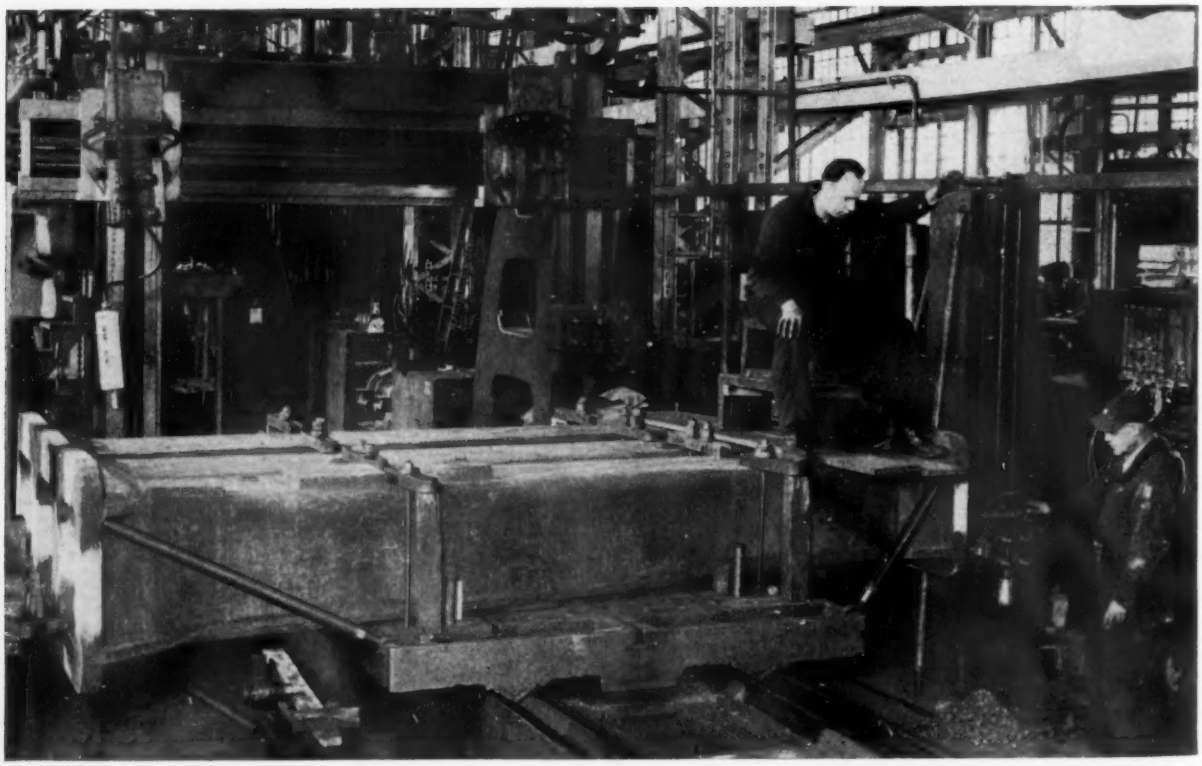
After the bottom surfaces have been machined, the casting is turned around on the floorplate for machining the column pads and bearing blocks, as well as drilling and reaming the necessary holes. This set-up is similar to that employed for machining the bottom surfaces of the casting, in that the bedplate is set against angle braces which are securely clamped to the floorplate and are adequately braced to provide a rigid support. Before taking any cuts, the casting is carefully checked to insure that all surfaces will clean up in machining. Usually about ½ to 1 in. thickness of metal must be removed from each surface during the machining operations on the top of the casting. Rexalloy-tipped inserted-tooth cutters are employed for these milling operations; a special right-angle head

A pit in the floor beside this 8-ft. Carlton radial drill makes it easier for the operator when drilling, reaming and tapping holes in cylinder castings. Several set-ups are necessary for each casting because of the different faces to be machined





A 16-ft. Niles boring mill is used at almost the limit of its capacity when boring and facing cylinder castings. Special boring heads have been developed to insure accuracy of the cylinder boring operations



Top and bottom surfaces of cast iron columns are machined parallel with each other with this set-up. They are planed in groups of three front or three rear columns to reduce fitting on the erection floor to a minimum

being used for machining the six bearing block fits. With this head, the 12-in. diameter face mill cutter is used at about 15 r.p.m. with a 5-in. per min. feed when roughing. The depth of cut varies from $\frac{1}{8}$ to $\frac{1}{4}$ in. Finishing cuts are taken at 20 r.p.m. with a $\frac{1}{8}$ in. depth of cut and a 5-in. per min. feed. The right-angle cutter head had to be designed with sufficient strength to support the cutter and yet be small enough to pass through the bearing block openings when machining these surfaces. In addition, this head is used for machining the vertical surfaces at each end of each bearing block and the head had to be made small enough to pass between the No. 4 and No. 5 bearing blocks. An accompanying sketch shows the general layout of this ball- and roller-bearing head.

A number of planer, boring mill, and radial drill press operations are required to machine the three cylinder castings required for each engine, while the six column castings are finished in a relatively few planer and radial drill press set-ups. Particular attention is given to the boring of the three cylinder castings in order to insure straight and round bores. A 16-ft. Niles boring mill having a special ram is employed for these operations. The ram is accurately centered over the table and its bottom end is supported in a bushing in the center of the table of the machine. The ram carries a boring head having cutter blocks on opposite sides. Each block carries a heavy-duty tool fitted with a Rexalloy bit. The head is traversed down the ram by a screw actuated by a star feed mechanism. Two roughing cuts and one finishing cut are taken.

Spring-Type Tools for Finish Cuts

When boring the 37-in. diameter medium-pressure center cylinder casting, each rough boring cut is taken with the table running at $2\frac{1}{4}$ r.p.m. and with each of the two roughing tools taking a cut approximately $\frac{3}{8}$ in. deep with a $\frac{3}{64}$-in. per rev. feed. When finishing, a single spring-type tool holder is used and only a light cut is taken with the same speed and feed. In order to insure that the ends of each cylinder are square with the bore, they are faced in the same set-up. For facing the bottom end, a special star-feed is mounted on the ram so that an even cut can be taken.

Machined cylinder castings go to an 8-ft. Carlton radial drill press for all drilling and tapping. A few of the holes are drilled to layout, but most of them are drilled according to jig plates made up to insure accurate fitting of cylinder head castings which are drilled to the same jig plates. Drilling for fitted assembly bolts must be very accurate. These holes are drilled somewhat undersize, so that they can be reamed at assembly. Three set-ups are required at the drill press for each high pressure and low pressure cylinder in order to complete the drilling required on the two ends and the mating side of each casting. For the medium pressure cylinder, which fits between the two other cylinder castings, four set-ups are necessary. Because of the size of these cylinder castings, a pit has been dug beside the radial drill to permit carrying out the necessary operations without the arm being raised to the top of the machine column. This makes it easier for the operator to do his work.

Planing of the six cylinder support columns involves several interesting set-ups. Pads on each column for mounting the condenser, air pumps, reversing engine, turning engine and other accessories are machined in separate set-ups, one column being mounted on the planer table at a time. The crosshead guides on each of the three rear columns are machined in the same manner.

Planers Handle Oversize Castings

Top and bottom surfaces of the columns must be planed parallel with each other, and at equal distances apart for each set of three front and three rear columns. No planer is available having sufficient clearance between side columns to plane these surfaces with standard sideheads in the normal manner. Therefore, the columns are placed across a planer table in groups of three front or three rear columns, and these columns are passed between outboard tool support columns mounted on the floor on either side of the planer table, as shown in the accompanying illustration. Standard planer sideheads are mounted on each of these two columns, and the heads are fed by hand at the end of each stroke. High-speed steel tool bits carried in O.K. tool holders are mounted in these heads. With reasonable care in setting up the work, good accuracy is obtained with this method.

Andrews & Cameron type slide valves are used for the low and medium pressure cylinders, while piston type valves are employed for the high pressure cylinders on these engines. Valve saddles for the low and medium pressure cylinders are planed to accurate dimensions on a 60×60 in. Bertram openside planer having a 20-ft. table. Four of the low-pressure saddles, or six of the medium pressure saddles are planed at the same time. The same machine is employed for radius planing rocker bar links, using a special radius attachment as shown in one of the accompanying illustrations.

Crankshafts for these Liberty ship engines are of the built-up type with crankpins and journals shrunk into heavy steel crank webs. The crankshafts are made up in two sections, being joined together by a solid coupling. The forward section of the crankshaft carries the crankpins for the high and medium pressure cylinders, while the rear section carries the crankpin for the low-pressure cylinder. Each completed crankshaft weighs approximately 20 tons.

The crank webs for the build-up crankshafts are

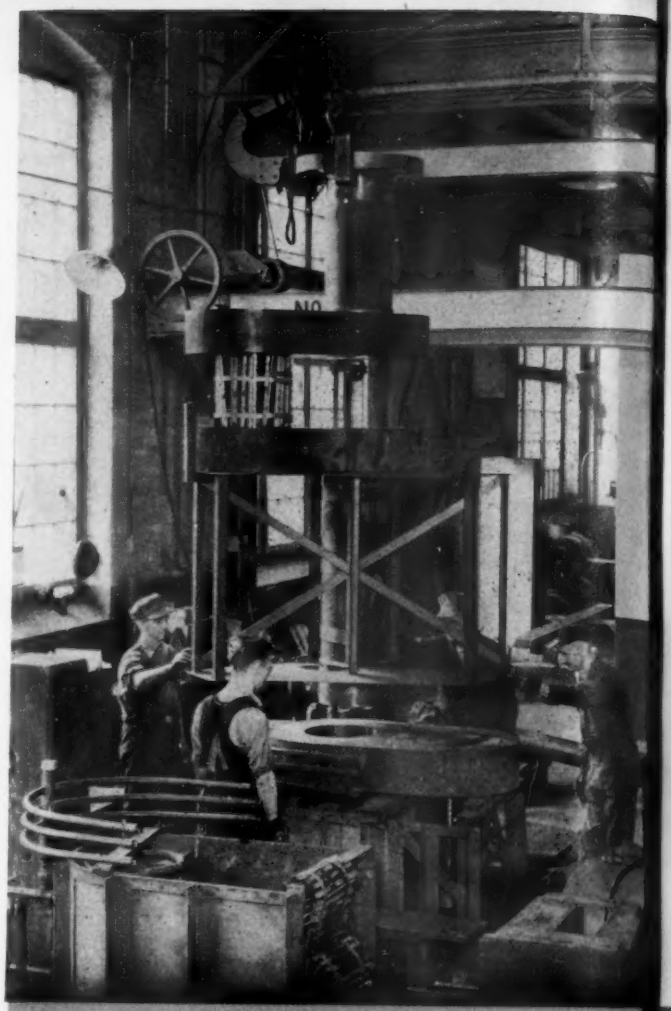
flame-cut from heavy rolled plates and then machined in pairs to assure accurate alignment of the holes bored in each pair of webs for the crankpins and journal shafts. Each pair is tack-welded together, one on top of the other, and the pair of webs is bored at the same time. The holes are bored undersize for a shrink fit on the pins and journal shaft sections. A shrink allowance of 0.0015 in. per inch of diameter is allowed. Thus, the hole bored for a shrink fit on a 14-in. diameter shaft is 0.020 to 0.022 in. undersize. Care is taken when boring the web sections that the holes in each end of the web are parallel.

Crankpins are rough turned in a large heavy-duty engine lathe, leaving 0.003 to 0.004 in. of stock for grinding. Then, before assembly into the crankshaft, the crankpins are finish ground to size within plus 0.000, minus 0.002 in. These pins are not machined at all after the crankshaft has been assembled, so every precaution is taken to protect the ground finish provided by this operation. Journal shaft sections are turned to size for a shrink fit in the web sections, but are finish machined after the crankshaft has been assembled.

The assembly of the built-up crankshaft is done with particular care, in order to insure that the three crankpins are in proper angular relation with each other, and that the journals are aligned properly. Each shaft is assembled in sections so as to permit drilling and reaming for dowel pins before the assembly of another web section makes this difficult, if not impossible. The crankpins are keyed into their webs with 1½ in. diameter dowels, while 2¼ in. diameter dowels key the webs to the journal shaft.

For shrinking the webs onto the pins or journal shaft, the webs are mounted horizontally between gas burners and heated to a proper temperature. Then the built-up shaft section being assembled is lowered vertically into the web hole as shown in the accompanying illustration. Gages are fitted around each crankpin or journal shaft length to insure proper spacing of the webs. Two heating installations have been provided for the crankshaft assembly group, in order that a web can be heated while a previously assembled unit is allowed to cool.

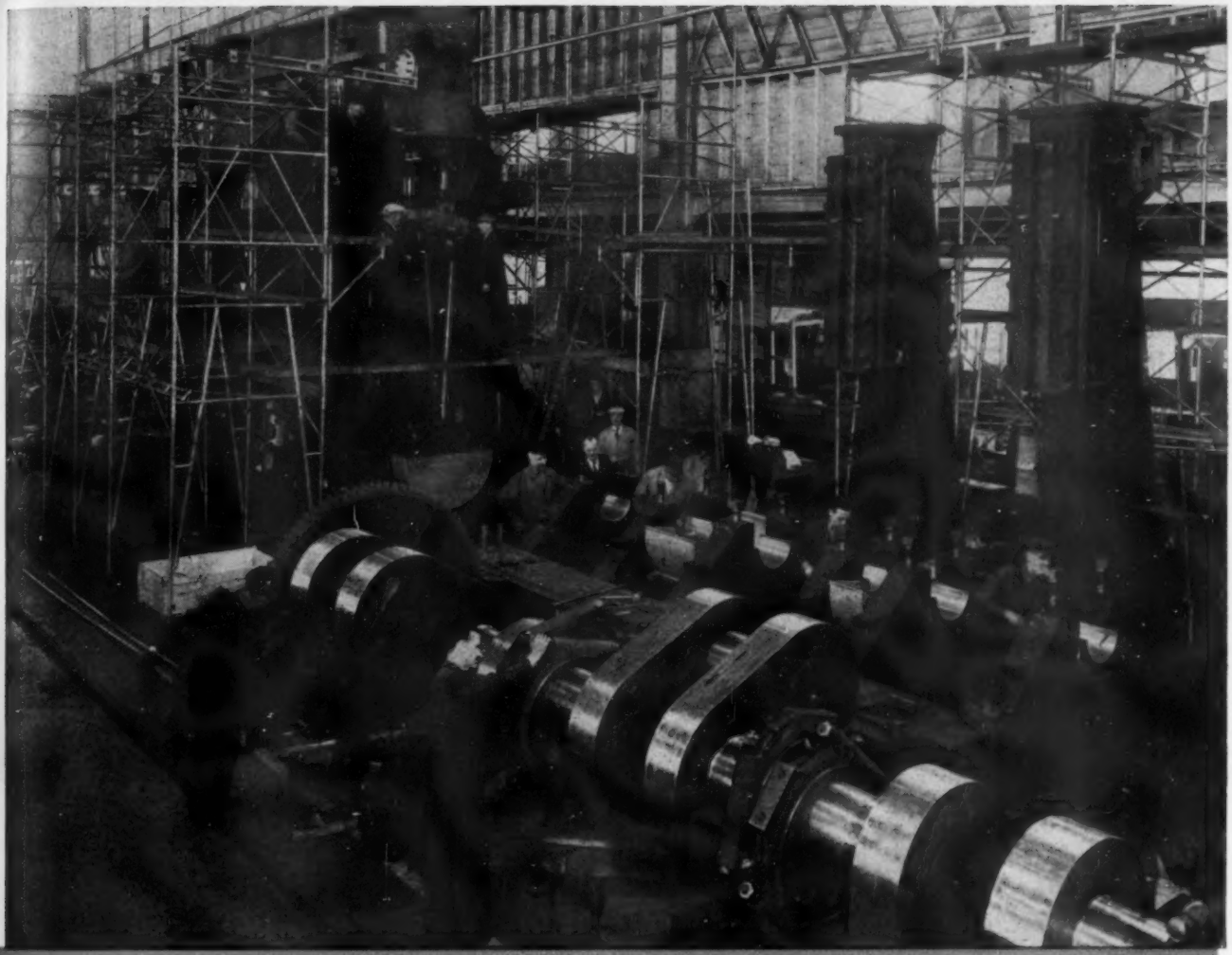
Keyways are milled in the journal shaft for the eccentrics after the crankshaft has been built up. Then, the six journals are finish turned to a diameter of 14.250 in. within plus 0.000, minus 0.002 in. Spiders, or spacers are fitted between each pair of webs before the crankshaft is placed in the lathe for the final turning operations. This is done to prevent sagging. A steadyrest also is used to support the crankshaft during these turning operations.



Built-up crankshafts are assembled by shrinking heavy steel crank webs onto the several journal and crankpin shafts. Care is necessary to insure proper angular spacing of the crankpins and accurate alignment of the journals

Each part finished by the machine shop is carefully inspected before delivery to the erection floor. The crankshafts are carefully checked for alignment; journal bearings on each shaft must be within 0.004 in. of alignment from one end of the crankshaft to the other. Cylinders are tested hydraulically for leaks, the pressures being 340 lb. per sq.in. for the high-pressure cylinders, 120 lb. per sq.in. for medium-pressure cylinders, and 40 lb. per sq.in. for low-pressure cylinders.

Activities on the erection floor are separated between two departments. In one, subassemblies are made up and checked, studs are fitted around the cylinders for mounting the cylinder heads, and valves are scraped to fit in the cylinder castings. The men performing subassembly operations spend all their time on the same type of work, thereby utilizing their skills to best advantage. For example, the same men are assigned to the same scraping operations as each

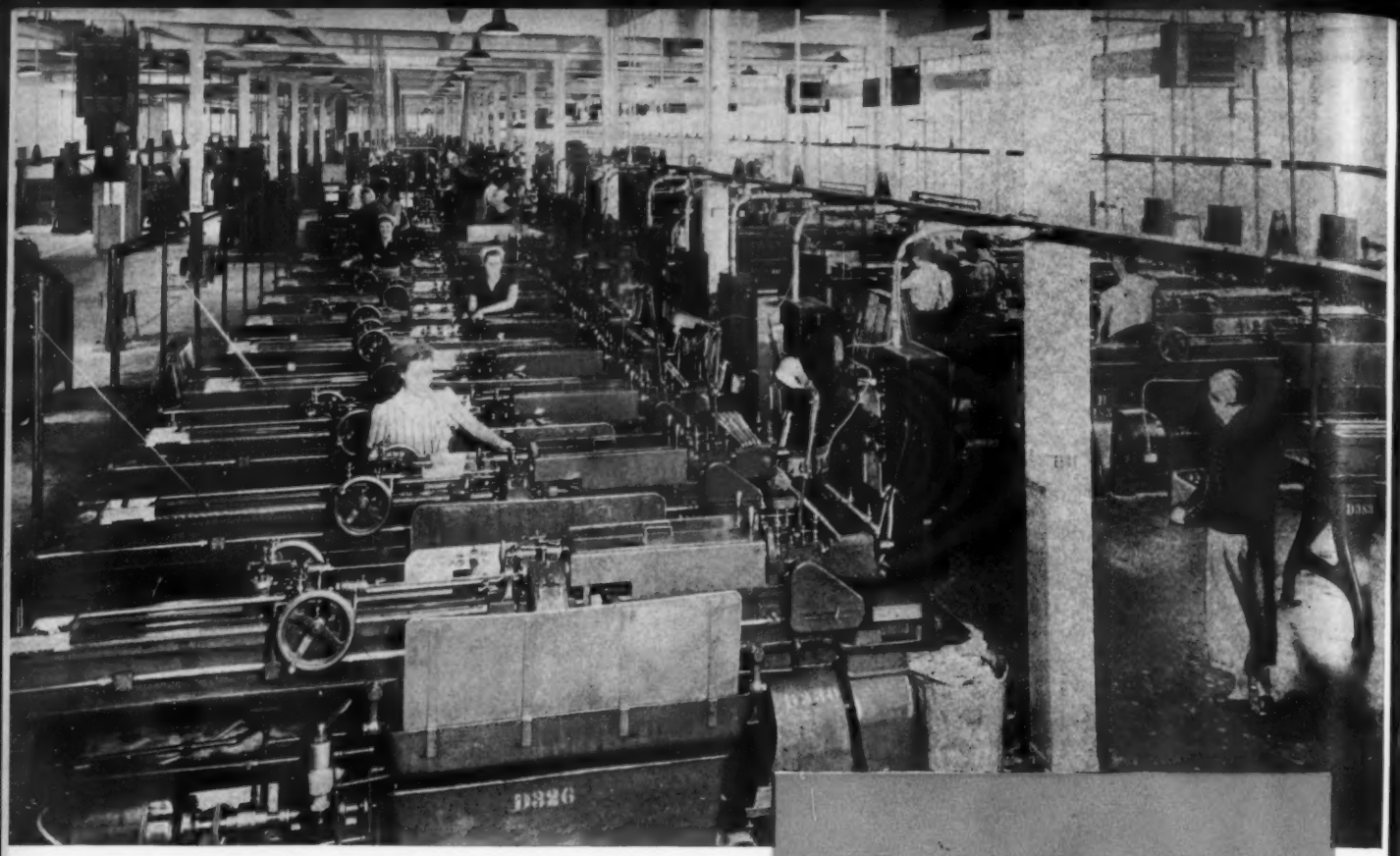


Two stages in the erection of an engine are shown. The men in the foreground are fitting the bearings for the crankshaft of a engine whose bedplate has been on the erection floor only a few hours, while in the background is shown another group at work on an engine that has been assembled and is ready for mounting the lagging around the cylinder castings

engine comes through. These men know what is required and need little supervision. The Andrews & Cameron type slide valves, for example, are scraped carefully to provide a 0.004 in. clearance. The men doing this particular work have become familiar with all of the problems involved and can do the work to best advantage. In fact the time required for the erection of an engine has been cut to almost ½ of the original time by proper planning of the operations, improved methods, and increased skill on the part of the workmen.

Final erection of a complete engine is carried out by a group of men who are familiar with all of the problems involved. They mount and check all of the parts and subassemblies and finally test the operation of the engine by turning it over with the steam turning engine which is connected to the shop air line instead of to a steam line. When inspected and approved, lagging is fitted around the cylinder and the unit is torn down and mounted on flat cars for delivery to a shipyard.

Experience with this type of engine has shown that following sequence of assembly operations gives best results: (1) level bedplate on erection floor, (2) fit six crankshaft bearings in bedplate and scrape the bearings to fit the crankshaft, (3) remove the crankshaft to floor stands and fit eccentric straps, (4) mount rear columns on bedplates and align with crankshaft bearings, (5) mount crankshaft in bearings and fit bearing caps, (6) mount three front columns and align with crankshaft bearings, (7) fit three connecting rods and eccentric rods, (8) mount cylinder castings, (9) fit and connect pistons, (10) mount valves, valve gear, pump and turning engine, (11) mount and connect miscellaneous parts, (12) make and fit lagging, (13) tear down engine and transfer parts to flat cars, and (14) build crates around parts on flat cars.



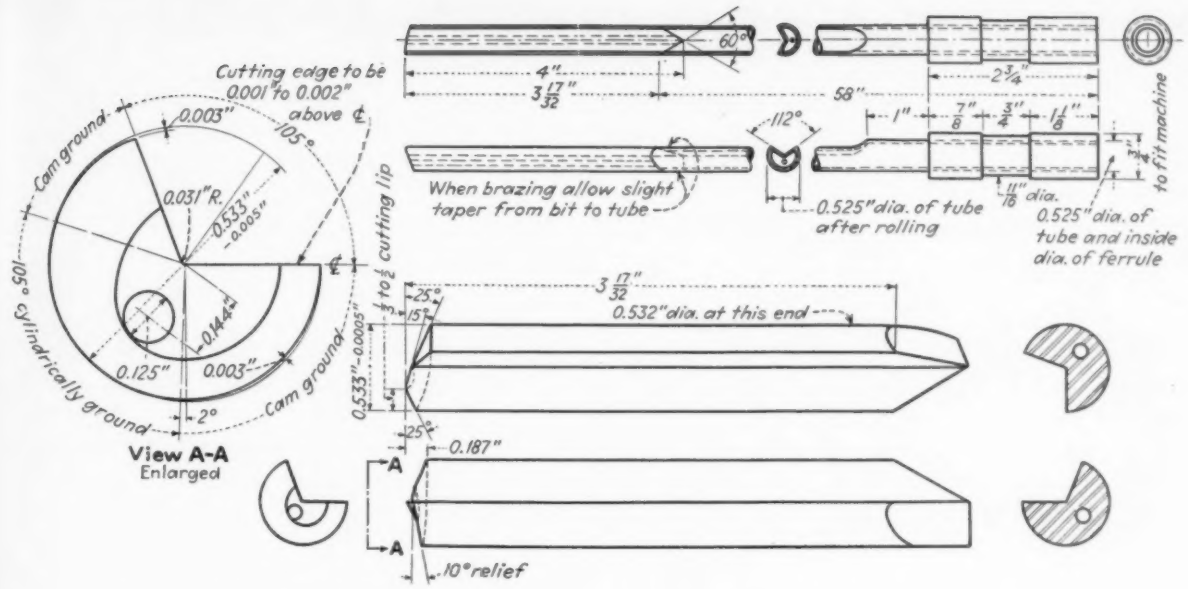
Canadian women have taken over many of the jobs involved in the production of barrels and other parts for the Boys anti-tank rifles. In this barrel department, for example, women operators have full charge of barrel drilling and reaming machines, milling machines and other equipment. Some of them have proven efficient as inspectors

Boys Anti-Tank Guns—Made in Canada

A CANADIAN arms plant, rated as one of the largest in the world devoted to the production of automatic weapons, has for some months been manufacturing cal. 0.50 Boys anti-tank rifles in addition to the Bren and aircraft-type Browning machines guns for which it was previously set up. The hard-hitting anti-tank rifles consist of 78 principal parts, fewer than either of the other two weapons. Each of these parts must be made to close limits of dimensional accuracy and surface finish to insure smooth action under all possible service conditions and to permit rapid repair of damaged weapons by ordnance service men.

Barrels for Boys rifles are machined from forged steel rounds weighing about 32 lb. as received. This weight is reduced to approximately 9 lb. 14 oz. in a series of more than 35 machining operations. The forgings first are normalized, then delivered to the machine shop where engine lathes are used for taking a skin cut from the diameter for a short length at each end. Next, they are returned to the heat-treating department for tempering to a hardness of 241 to 311 Brinell. The quench at the end of this heat treatment is carried out in a special Gogan quenching machine which supports a hot barrel forging between power-driven rotating rolls as it is dipped into an oil tank below the machine in an automatic cycle.

The forgings then are milled to length, centered in both ends at the same time in a Sundstrand double-end centering machine, and turned at the center for a steadyrest bearing in a LeBlond engine lathe. Two LoSwing automatic lathe set-ups are employed for rough form turning these barrels, one for the muzzle end and the other for the breech end. Five carbide-tipped tools are used in each rough turning set-up. Each tool is ground differently, according to the depth of cut to be taken, and each has a chip curler ledge ground along the cutting edge. The $1\frac{3}{4}$-in. diameter rough forging is rotated at 500 r.p.m. for each of the rough turning operations. Feed is about 0.008 in. per rev. These roughing operations leave sufficient stock for finishing the barrel all over after it has been



Bits for V-drills used for deep-hole drilling barrels, breech bolts and bodies for the Boys rifle are machined all over, hardened to about 66 Rockwell C, finish ground, and then nitrided before brazing to the tube which forms the drill extension. The bit and the tube must be accurately aligned for the brazing operation

drilled, reamed and straightened as explained below.

After rough turning, the barrels are drilled with V-bit drills in W. F. & John Barnes two-spindle deep hole drilling machines. Two barrels are drilled during each set-up. Because of the quantities involved, it has been found more economical to make the V-bits required than to purchase them from outside suppliers. Design of the drills used for the Boys rifle barrel is shown in the accompanying sketch. The bits are machined from 18-4-2 high-speed steel, and are hardened and ground, then nitrided before brazing to the tube. Experience has shown that the minimum permissible hardness for these bits is about 63 Rockwell C, and that effective tool life is increased materially when the hardness is nearer 66 Rockwell C. A $\frac{1}{8}$-in. diameter oil hole is drilled longitudinally through the bit before hardening to provide for a steady flow of oil under high pressure to the cutting edge when the drill is in operation.

The shank of the drill is made from SAE 1020 seamless steel tubing which is rolled to a V-shape for almost its entire length to provide chip clearance. Diameter of the tube is 0.008 to 0.025 in. smaller than the bit diameter. It must have a polished surface that is free from nicks. The ferrule sweated to the rear end of the drill tube is machined from cold-rolled steel to suit the machine in which the drill is to be used. Bit and tube must be accurately aligned when brazing together. For accurate drilling of deep holes, it has been found best to sharpen all V-bit drills by machine rather than by hand, and hole accuracy is maintained only when drills are sharpened as soon as they cease to cut freely.

Drilled barrels are draw-reamed in three operations, using slightly larger reamers for each pass. Like the V-bits employed for drilling the barrels, the reamers are made in the toolroom. Design and dimensions of these reamers are shown in an accompanying sketch. Reamer bodies ordinarily are made from Rex-MM or a similar tool steel, hardened to a minimum of 63 Rockwell C, and then finish ground to size. The adapter also is made from tool steel, hardened and ground. Both the reamer body and the adapter are securely sweated into a 50-in. length of seamless steel tubing that has been machined to the dimensions shown. Hand honing of the reamer cutting edges had been found to improve results obtained with these tools.

High Oil Pressure Gives Good Finish

Draw-reaming operations are performed in two-spindle Builders Iron Foundry horizontal deep-hole reaming machines with the work spindles rotated at 125 r.p.m. Feed is about $3\frac{1}{4}$ in. per min. Hollow centers are employed to permit passing the reamers through the center-supported barrels. While reaming, oil is fed to the cutting edges at a pressure of 500 lb. per sq. in. or more through the hollow tube forming the shank of the reamer. Girls operate both the deep-hole drilling machines and the reaming machines.

Each barrel next is checked for straightness by a shadow method brought over from a British plant visited by company representatives when setting up for the Bren machine gun. The barrel is held to the eye and pointed at a glareless light source. The regularity of a cone-shaped shadow seen in the bottom of the bore as the barrel is slowly rotated is a measure of the straightness of the bore. Special screw-type straight-

ening presses have been developed to support the barrel at the proper height for sighting, thus permitting straightening without removing the barrel from the sighting stand. Usually about six months training are required before an operator becomes skilled in judging where a barrel is out of true by the irregularities in the shadow. Nevertheless, it is claimed that a proficient operator can turn out more straightened barrels in a given time by this method than by any other known method. Originally this operation would be carried out only by sighting the barrels at the northern sky on clear days. No other light source then available gave satisfactory results. Recently, however, it has been found that the operation can be carried out efficiently by sighting at a large fluorescent-light reflector fitted with a ground-glass screen. Now the operation can be carried on by day or night, no matter what the weather conditions outside the plant.

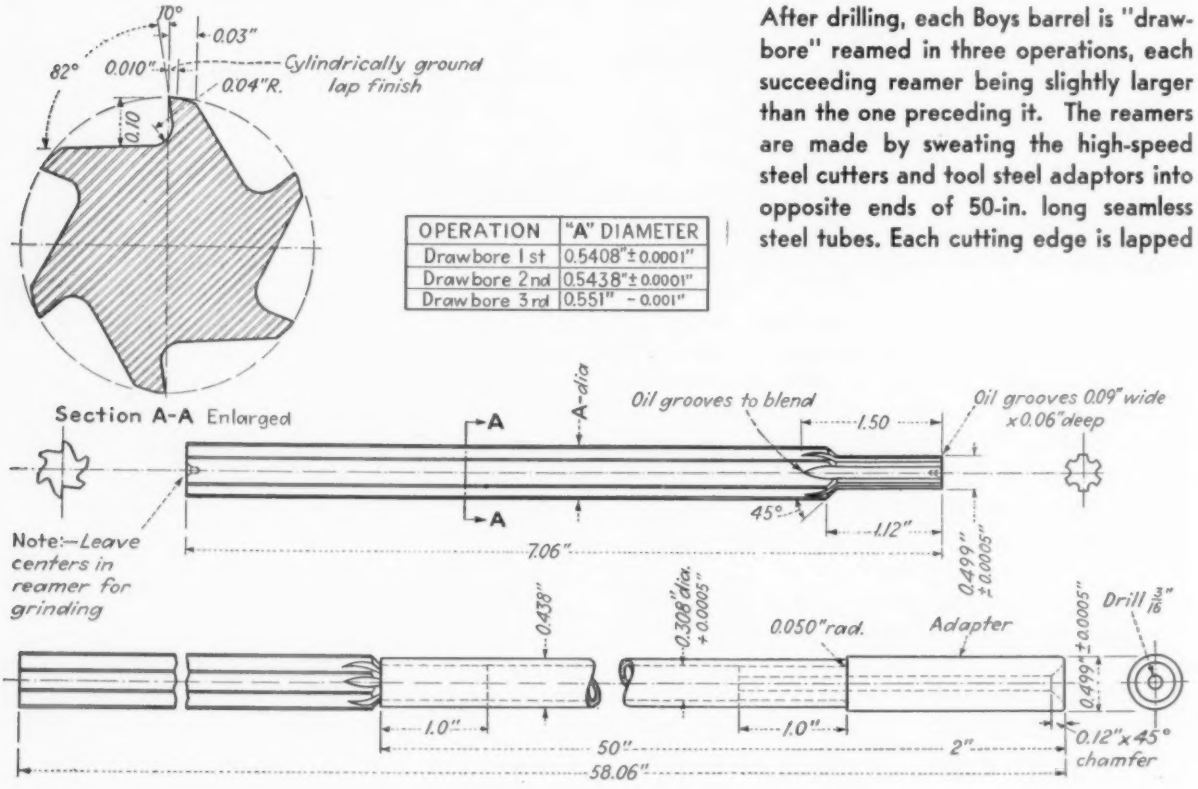
Facing and Recentering the Barrel

Straightened barrels next are faced to length within 0.003 in. of the specified dimension, with the ends square with the axis of the bore. Two set-ups in Ford-Smith lathes are employed for facing the two ends. In each machine, the spindle is supported in a fixture on the lathe carriage and a piloted counterbore held in the spindle is used for the facing cut. The carriage is fed forward by hand against a positive stop. Then, the barrels are recentered in each end in a Sundstrand double-end machine. The centers produced must be within 0.010 in. of the correct depth, and must be concentric with the bore within 0.003 in. to insure concentricity in the following finish turning operations.

After centering, the barrels go to a Norton cylindrical grinder where a 1½-in. wide band is ground at the center to provide a steadyrest bearing for turning.

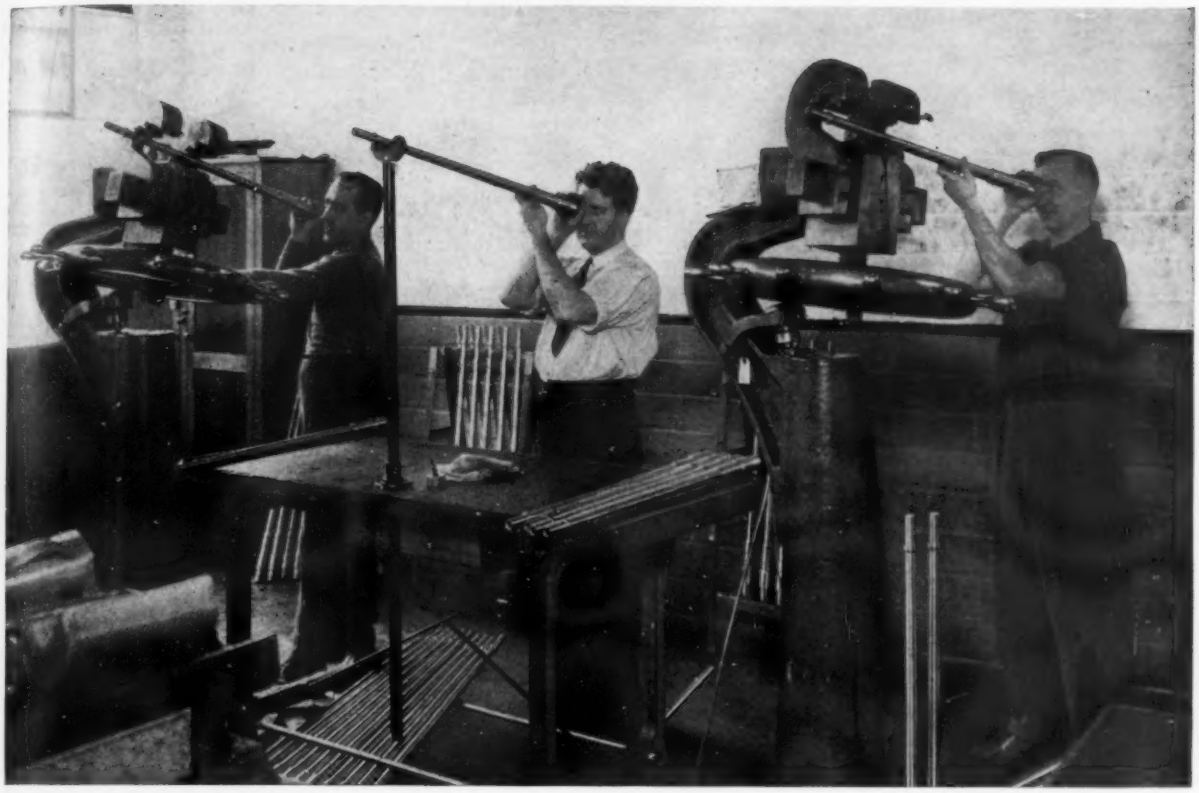
LoSwing automatic lathes set up very much like those employed for rough turning operations are used for finish turning the breech end and the muzzle end of each barrel. Each machine is fitted with five carbide-tipped tools set in cam-controlled slides on the front carriage. In each case the depth of cut is approximately $\frac{3}{32}$ in., spindle speed is 500 r.p.m., and feed is 0.006 in. per rev. Outside diameters must be within 0.004 in. concentric with the bore. About 0.010 in. of stock is left for subsequent cylindrical grinding operation. Following these operations the barrels are restraightened and recentered as outlined above, with the centers held within 0.004 in. of the specified depth and within 0.002 in. concentricity with the bore. The next two operations consist of finish grinding two outside diameters at each end of the barrel in Norton grinders, one machine being set up to grind the two diameters at one end and another for those at the other end.

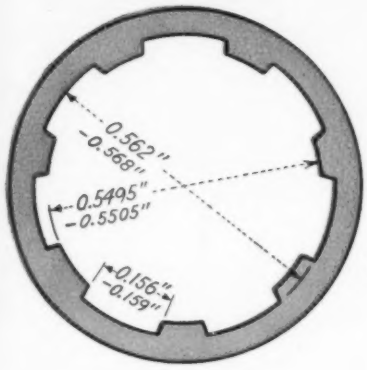
No. 7 Ward turret lathes next are employed for turning the thread diameter, facing shoulder lengths and turning chamfers at the breech end of the barrels.



OPERATION	"A" DIAMETER
Drawbore 1st	0.5408" ± 0.0001"
Drawbore 2nd	0.5438" ± 0.0001"
Drawbore 3rd	0.551" - 0.001"

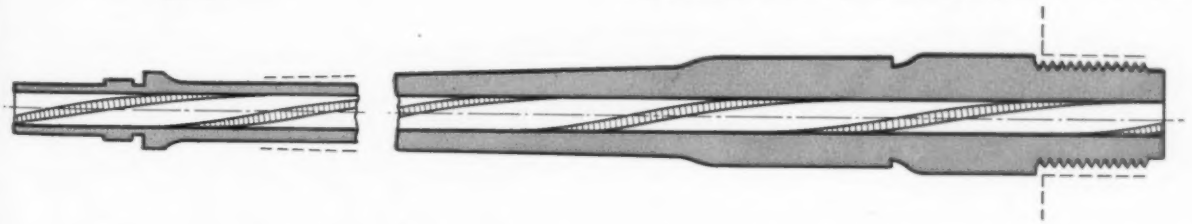
After drilling, each Boys barrel is "drawbore" reamed in three operations, each succeeding reamer being slightly larger than the one preceding it. The reamers are made by sweating the high-speed steel cutters and tool steel adaptors into opposite ends of 50-in. long seamless steel tubes. Each cutting edge is lapped





Each Boys rifle barrel is inspected for straightness three times during the course of its manufacture, and then again in the final inspection group. Straightness is checked by looking through the barrel at a glareless light source. Irregularities in the cone-shaped shadow tell an experienced inspector where and how much the barrel bore is out of true

Seven helical rifling grooves 0.156-0.159 in. wide are cut simultaneously in the bores of Boys barrels by pull broaching. These grooves formerly were cut by conventional methods with single-point rifling tools



Carbide-tipped single point tools and a high-speed steel form tool are mounted on the cross-slide of each lathe set up for this operation. All dimensions must be held within 0.002 in. for size and concentricity. The barrel is supported in a collet chuck in the spindle of the lathe, with the muzzle end of the barrel being centered and supported by a spring-loaded cone center inside the spindle. Speeds and feeds are varied by the operator to suit the different cuts.

The breech end is threaded in an 8×16-in. Hanson-Whitney thread hobber, with the barrel held in a four-jaw chuck and with the breech end supported by a steadyrest. A length stop insures bringing the barrel in the proper location so the thread will be hobbed within 0.030 in. of the shoulder on the next larger diameter. A Whitworth form thread, ten threads per inch, is hobbed to within 0.001 in. of a pitch diameter of 1.625 in. with a ten-flute hob. A shop inspection station following this hobbing operation checks the threads produced for size, concentricity and finish. Accuracy is important, as the threaded fit of the barrel into the gun body must bring the front and rear sights into proper alignment.

Until recently bore-finishing operations in rifle bar-

rels made at this Canadian plant followed in general practices employed at the British plant visited by officials and key workmen when gun making activities were first started in Canada. Following the final operation on the barrel exterior, the bore was "spill-bored," or pack reamed, to produce a highly polished, straight hole. Then the rifling grooves were roughed one at a time, and finish-cut one at a time with single-bit draw cutters in two-head horizontal rifling machines of conventional design.

Production per rifling machine of barrels for the Boys gun has been multiplied several times by using Lapointe rifle broaching machines in place of the conventional rifling machines employed for other rifle barrels made in the same department. Each Lapointe machine has a six-station drum fixture for centering and holding the barrels during the five automatic broaching cycles required to finish a barrel. One station on the fixture is used for unloading finished barrels and loading uncut barrels, the other five positions hold barrels in various stages of finishing. Spaced between each work holding station on the fixture is a horizontal copper tube through which the broach for the adjacent work position is returned to the starting location.

All five broaches are pulled through the work and returned through the tubes at each cycle of the machine. At the end of the forward stroke, when the

Lapointe rifle broaching machines are used for finishing the bores of Boys anti-tank rifles. Five pull-type broaches are employed, the first and the last broaches having round buttons to insure accuracy of the 0.5495-0.5505 in. diameter across the top of the lands. A six-station fixture is employed, so that the operator can unload and reload while the machine is performing its automatic cycle

broaches have been pulled out of the work pieces, the work fixture automatically indexes one-twelfth of a turn to bring the tubes in line with the broaches. Then the main cylinder of the machine returns the broaches through the tubes, where they are picked up by collet chucks on a rear carrier and held while the fixture indexes to bring the work pieces into line. At this point in the cycle the rear carrier advances the five broaches until they are picked up by the forward carrier for the cutting portion of the cycle. The forward hydraulic cylinder operates at a speed of 40 ft. per min. while the broaches are cutting, and at 80 ft. per min. when returning the cutters through the tubes.

The first broach has twelve round buttons and serves to size the bore of the barrel, which must be held between 0.5495 and 0.5505 in. diameter. The use of this broach eliminates the "fine bore" operation formerly done with a pack reamer. The next three broaches rough, semi-finish and finish out the seven rifling grooves in the bore. Each of these three broaches has twelve buttons, and each is rotated as it cuts so as to produce helical grooves having a 16-in. lead.

The rough rifling broach cuts each groove to a depth of about 0.0025 in. and to almost its full width. The semi-finishing broach increases the depth of each groove another 0.0025 in. Finally, the groove finishing broach cuts the grooves to their full width of 0.156 to 0.159 in. and to their full depth, making the diameter at the bottom of the grooves 0.5620 to 0.5680 in. The fifth and final broach in the series has twelve round buttons which remove the burrs raised by the grooving broaches and insures holding the bore diameter within the specified limits.

A special grinding machine has been installed for sharpening the cutters used in the rifle broaching units. Experience has shown that from 80 to 100 barrels can usually be cut with each of the five broaches between regrinds. Also, when the grinding allowance has been used up on a given broach it usually can be ground to the size required at a preceding station. For example, when worn down, the broach for the fifth station can be sharpened for the first station, while the broach for the fourth station can be reground for the third station and again for the second station.

Vertical Lapper Polishes Rifle Bores

Rifled barrel bores are polished in special four-head, vertical lapping machines developed by this Canadian company. For this operation a lead draw lap is cast on a steel draw rod to fit the individual barrel. When the lap is cool, the rod is removed from the barrel and the lap head is nicked to hold the polishing compound. Then the barrel with its lap is placed in the draw lapping machine. Chucks for the draw rods operate in ball-bearing heads so the laps will follow the helical rifle grooves freely.

Usually the laps are entered from the breech ends of the barrels. However, the barrels can be reversed to polish out any defects discovered during the lapping operation. Clover "D" fine lapping compound is used, with light spindle oil being employed to thin out the compound if a barrel becomes too warm during the

Chambering is regarded by gun makers as an art, there being no allowable limit on any part of the chamber. The chamber plug gage must show 100 percent bearing at each point checked. Both roughing and finishing operations on the chambers are performed in Ford-Smith lathes

A number of milling operations must be performed at both ends of each Boys barrel. To insure accurate alignment of the milled grooves and flats with the threads at the breech end, a locating block is fitted to these threads prior to milling. A separate machine is used for each of the eight milling and surface grinding operations performed before this block is removed

operation. Time required for lapping is determined by the temperature of the barrel, a finished barrel will cool off while being lapped while a rough barrel will be warm to the touch.

Following the lapping operation, the barrels are delivered to an inspection group where the bores are cleaned with Varsol, and the condition of the rifling grooves is inspected visually in the same type of stand as was used for checking the straightness of the bores. Size of bore and of the rifling grooves is checked at this station.

Accepted barrels next are rough chambered in Ford-Smith lathes, each equipped with a long spindle extension supported by an outboard bearing and containing a collet chuck for centering and driving the barrel being chambered. The muzzle end of the barrel is held in a spring-loaded cone center inside the spindle of the lathe. The turret on each of these lathes has been replaced with a special toolholder block fitted with a quick-acting chuck for holding the chambering reamers. The toolholder is of a floating type in order that the reamers will align properly with the barrels. Three roughing reamers are used, each reamer being relieved five or six times during the operation before it reaches the full depth of cut. Oil is pumped through the barrel from the muzzle end so as to wash chips out each time the reamer is relieved by withdrawing it from the chamber. The turret slide is traversed by hand for feeding the reamer into the cut. Spindle speed is 100 to 125 r.p.m.

Chambers are finish reamed in a similar set-up on another Ford-Smith lathe, again using three reamers and feeding them by hand. For this operation the spindle speed is reduced to 75 to 80 r.p.m. The chambers must be to gage size, so the work is held to the low side of the diametral limits. This leaves material so that the chambers can be lapped to size. For both the roughing and the finishing operations on the chambers, it has been found best to hand hone the reamer cutting edges. Each finished chamber is carefully inspected before the barrels are moved to the milling group where finishing operations are performed.

Location Method for Breech Milling

In order that the barrels may be properly located for the milling operations which follow the chambering operations, a locating block is mounted on the threads at the breech end of each barrel. This locating block insures that the milled surfaces are properly aligned with the threads which will locate the barrel in the gun body.

Following inspection, the muzzle end of each barrel is cut to length. This operation removes the heavy cone center in the end of the barrel and leaves a straight barrel end. The muzzle end is chamfered on the outside diameter and faced to length with a hollow mill in a Ford-Smith lathe. The length of the barrel is held within 0.009 in. of the specified length.

In a following operation performed in a Ford-Smith lathe, a 45-deg. chamfer is cut on the inside diameter at the muzzle end. This chamfer must be concentric with the bore and must be with 0.003 in. of the required depth. The muzzle end next is thread hobbed in a Hanson-Whitney machine. This thread is for mounting the flash arrester, and the threads must be concentric with the bore.

In the next operation the breech end is faced in a Bardons & Oliver lathe, with a 0.001 in. tolerance on thread location and a 0.002 in. tolerance on the dimension from the end of the reinforced diameter to the end of the breech bearing. Carbide-tipped tools are mounted in the cross-slide turret.

Tool for Lapping Cartridge Chamber

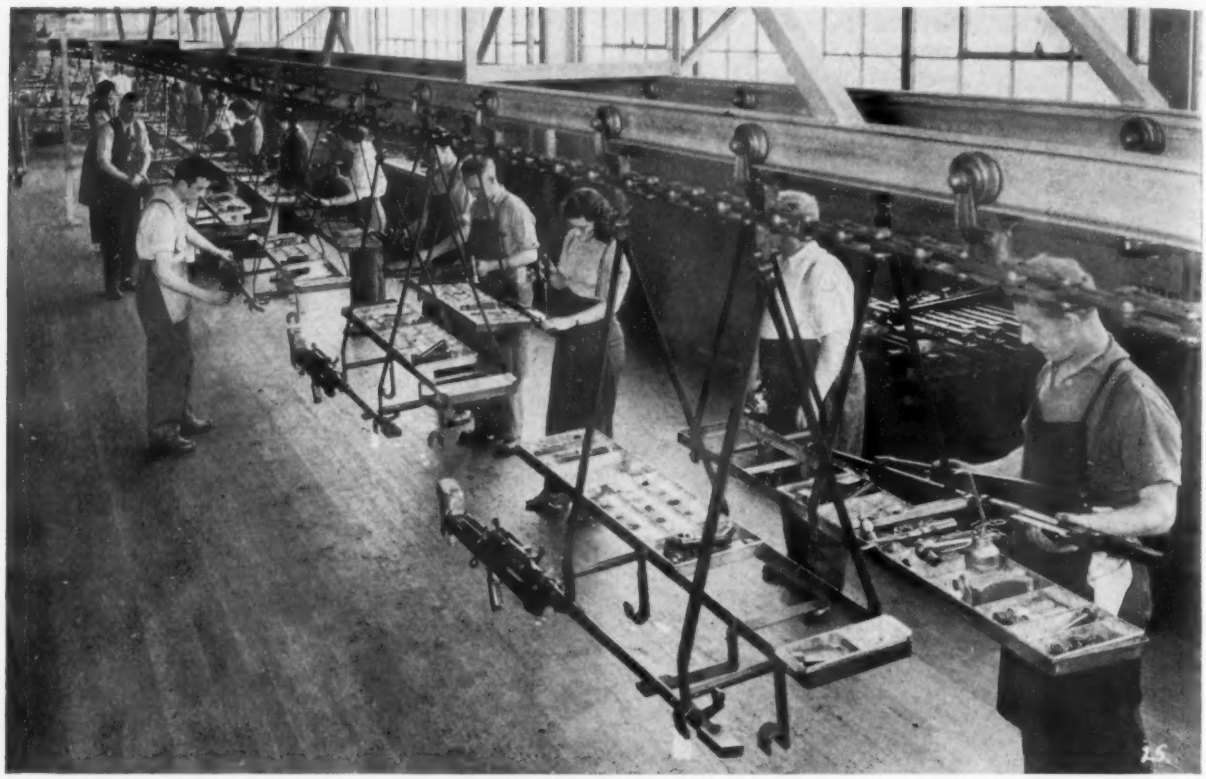
The final machining operation on each barrel consists of polishing the cartridge chamber to a mirror finish in a Ford-Smith lathe. A steel lapping plug is machined to cartridge form with all diameters sufficiently undersize to allow space for one thickness of emery cloth. This is one of the most important operations on the barrel. No tolerance is allowed on any of the diameters of the chamber, and the operation must be carefully performed to insure against leaving any scratches or other defects in the chamber surfaces. Spindle speed is approximately 115 r.p.m, and the emery cloth is kept well oiled throughout the operation. Finally, the barrels are restraightened and inspected for straightness of bore and accuracy of all dimensions. The barrels are browned in the heat-treating department, the threads are cleaned, and the barrels are shipped to the government inspection group for final inspection. It is of interest to note that women have successfully been trained for inspection operations on these barrels, including the straightening and checking of bores for straightness.

Assembly operations on the Boys anti-tank gun have been broken down into tasks as much as possible, both to permit rapid training of assemblers and to permit the installation of a progressive assembly conveyor line which has proven highly advantageous. Before going to the assembly conveyor, all parts go through a government inspection and are delivered to a stockroom from which parts are sent to the assembly groups as needed.

The first critical assembly operation consists of selective assembly of the breech bolt and the body. The resist grooves in the bolt must match the mating grooves in the body. Interchangeable assembly of these two parts is not practical if any manufacturing tolerances are to be allowed, since these fits must be almost perfect. In order to insure proper fitting of the bolt to the body, the resist grooves on the end of the

Breech bolts and bodies for Boys anti-tank rifles are selected for assembly in order that the resist grooves in each will match perfectly. For this subassembly operation, the grooves on the end of the bolt are covered with soot by holding the piece over the flame of an oil lamp. Then, when cool, the bolt is inserted in the body and turned into position. When removed, the surfaces of the grooves are inspected to see whether the soot has been rubbed off all surfaces to indicate a perfect bearing

"Breeching" consist of selectively assembling barrels to bodies and pulling the joint up tight to form a single unit. The government inspector in this group checks every assembly to make certain that a perfect joint is accomplished, as indicated by alignment of ground flats on the two components



Novel carriers have been developed for the over-head chain conveyor assembly line used to produce Boys anti-tank guns in this Canadian plant. At the start of the line, trays containing sufficient parts for one gun are placed on each carrier by a sstockroom attendant. The constantly moving line then moves each carrier successively past a number of assembly positions where task operations are performed. For many of these operations, women have been found equally as efficient as men

bolt are smoked, or covered with fine soot, by holding this part over the flame of an open paraffin-oil burner. This has been found more practical than bluing the resist groove surfaces. The fit on the bolt groove surfaces must be rubbed off in assembling the bolt to the body in order to show full contact with the body grooves on both sides. The bolt is turned into position, and then withdrawn for inspection of the grooved surfaces. When a bolt has been found which fits perfectly in a given body, that bolt is marked with the number stamped on the body and the two units returned to stock for delivery to the assembly conveyor.

The breeching operation, which consists of selectively assembling the gun body with a barrel, involves screwing the barrel into a body so that flats ground on each will match accurately when the threaded joint has been pulled up tight with a heavy wrench. A government inspector works in this group all of the time, making a 100 percent inspection of every breeched assembly. In this operation, the bodies and barrels first are carefully inspected, and the threaded joint surfaces are cleaned to insure a proper fit. Then a body is placed in a bench vise, and the barrel is threaded into it with a small hand wrench. Next, the barrel is placed vertically in a floor stand which clamps it tightly near the breech end. A double-end adjustable wrench is placed around the body near the threaded end, and this wrench is turned by two men until the two ground flats, one on each part, are brought into proper alignment. Trucks loaded with assembled bodies and barrels are returned to the stockroom for delivery to the assembly conveyor.

As the overhead-type chain conveyor moves the carriers past the various assembly stations, task operations are performed until the gun is finally assembled and ready for government inspection. After the finished guns have been removed to racks in the assembly department, the conveyor carries the empty hangers past the stockroom. Here, special partitioned trays carrying small parts of a sufficient quantity to make one gun are placed on the hangar and an assembled body and barrel are hung on hooks on the carrier. From here, the conveyor carries the racks progressively past successive assembly stations. The chain conveyor travels continuously at a slow pace, the individual operations having been broken down to a point where the operator at each station easily can perform his task while a carrier is in his area.

TIME-DATA SHEET NO. 42

Radial Drill Press Operations—VII

Drilling:

The time values for drilling are listed on tables which show the speeds and feeds from which the values were derived. Separate tables are made for the various metals commonly used in the East Pittsburgh Works. The speeds and feeds shown for the various metals were obtained from a comparison of shop formulas used in the construction of this formula and from actual tests. The values are for high-speed steel drills.

It was found that the radial drills in use at that time were not equipped with motors sufficiently powerful to run 2¾ and 3 in. drills at the recommended speeds and feeds in steel. The drills were not damaged when run at the recommended speeds. For this reason, the feed per revolution has been decreased from 0.015 to 0.012 in. for 2¾ and 3 in. drills when drilling cold rolled steel, hot rolled steel, boiler plate and cast steel. The drilling tests were made on a 6-ft. radial drill driven by a 10-hp., variable-speed D.C. motor.

In drilling for a bottom tap, drill the hole deeper than the specified depth of the thread by one-half the diameter of the tap. This will allow room for chips below the tap when tapping.

Tapping:

The time values for tapping are listed in tables which show the speed from which the values were derived. Separate tables are made for the various metals. In computing the tables of tapping values, the lead of the second or plug tap was used. On this type of tap the lead usually extends back about three threads. Time is allowed in the formula for the tap to enter to the required depth and return, and also to reverse the machine at the bottom of the hole. No time is allowed for the operator to be constantly reversing or backing out the tap in order to relieve the tap in the work. When the proper size of tap drill and lubricant are used, it will be found that the tap can be run in to the proper depth before reversing the spindle to remove the tap.

Reaming:

The time values for machine reaming are shown on a separate table. This table shows the feeds and speeds for the various metals listed. This table gives the time allowed for reaming a hole 1-in. deep. The product of the tabulated value and the depth reamed equals the time allowance per hole. The same allowances were used as were applied to the drilling and tapping tables.

Counterboring:

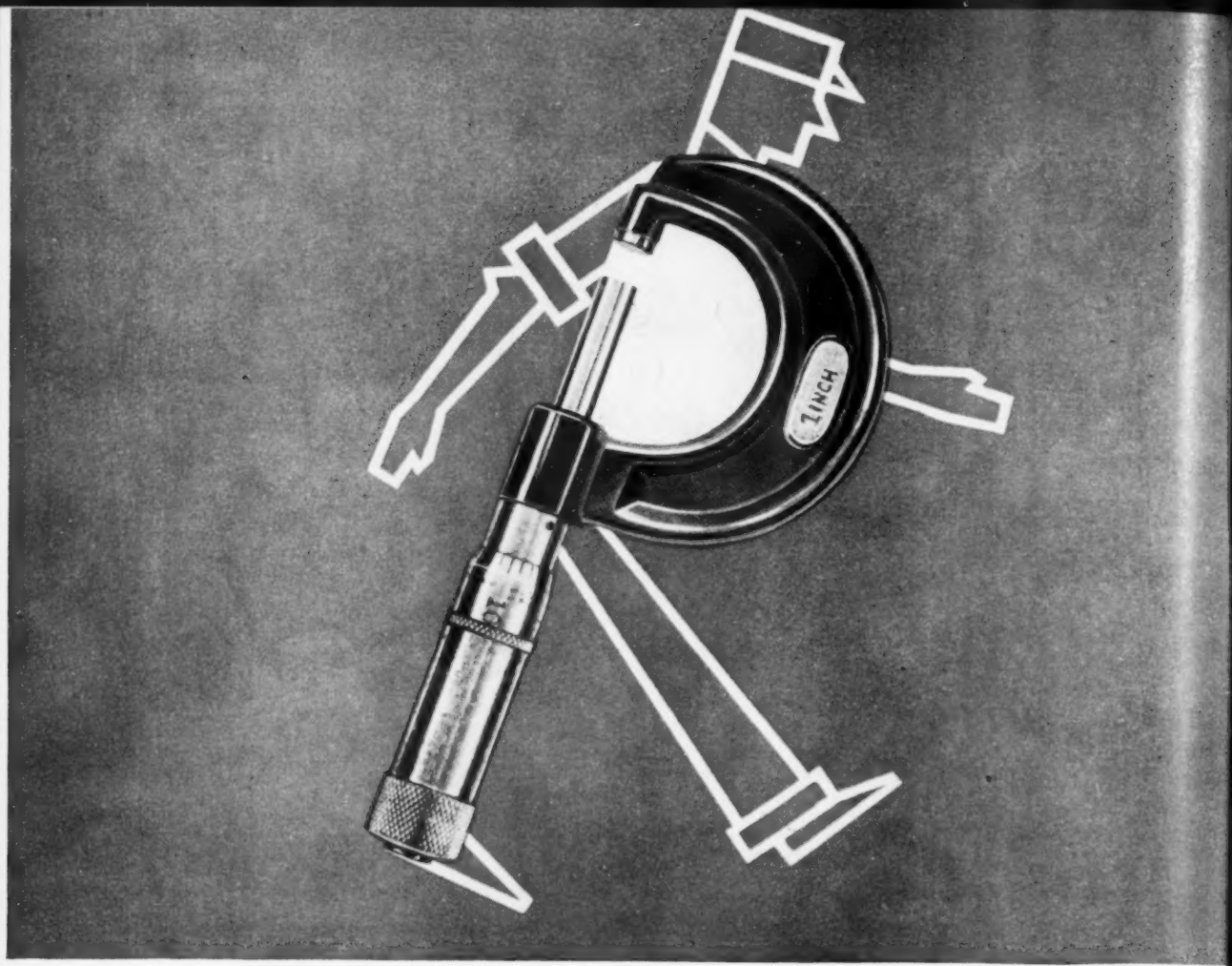
The time values per inch for counterboring different materials are given in a separate table. The test that was made on counterbores showed that solid counterbores give the best results. The shell counterbores are all right for holes 1/8 to 1/4 in. deep, but when counterboring deeper holes no clearance is provided for chips and the tool binds. The solid counterbores can be run at the same speeds and feeds as drills. No allowance has been made for different size leads. For any one counterbore, as the size of the lead increases, the horsepower necessary to run the machine decreases. However, if the speed and feed are kept constant, the time required to counterbore a hole to a specified depth should be constant, no matter what the size of the lead may be. With the variable

Table No. 6—Time To Drill Brass Alloys

(Peripheral Speed — 130 Ft. Per Min.)

Drill Size	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3
R.P.M.	1200	1200	993	661	497	398	330	283	248	221	199	181	165
Feed	0.006	0.009	0.012	0.012	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Drill Lead	0.075	0.113	0.150	0.225	0.300	0.376	0.451	0.526	0.600	0.675	0.750	0.825	0.900
Depth	Allowed time in decimal hours (includes drill lead)												
1/8	0.0005	0.0004	0.0004	0.0008	0.0011	0.0016	0.0023	0.0029	0.0038	0.0046	0.0056	0.0068	0.0080
1/4	0.0007	0.0006	0.0006	0.0011	0.0014	0.0020	0.0027	0.0035	0.0044	0.0054	0.0064	0.0077	0.0090
3/8	0.0012	0.0009	0.0008	0.0014	0.0018	0.0024	0.0032	0.0041	0.0051	0.0061	0.0072	0.0085	0.0100
1/2	0.0016	0.0011	0.0010	0.0017	0.0021	0.0028	0.0037	0.0046	0.0057	0.0069	0.0080	0.0094	0.0109
5/8	0.0019	0.0013	0.0012	0.0020	0.0024	0.0032	0.0042	0.0052	0.0064	0.0076	0.0088	0.0103	0.0119
3/4	0.0022	0.0016	0.0014	0.0023	0.0027	0.0036	0.0047	0.0058	0.0070	0.0083	0.0096	0.0112	0.0129
7/8	0.0026	0.0018	0.0017	0.0026	0.0031	0.0040	0.0052	0.0063	0.0077	0.0090	0.0104	0.0121	0.0139
1	0.0029	0.0020	0.0018	0.0029	0.0034	0.0044	0.0057	0.0069	0.0083	0.0098	0.0112	0.0130	00.148
1 1/8	0.0032	0.0022	0.0020	0.0032	0.0037	0.0048	0.0062	0.0074	0.0090	0.0105	0.0120	0.0139	0.0158
1 1/4	0.0034	0.0024	0.0022	0.0036	0.0040	0.0052	0.0067	0.0080	0.0096	0.0112	0.0128	0.0148	0.0168
1 3/8	0.0039	0.0027	0.0025	0.0038	0.0044	0.0056	0.0072	0.0085	0.0103	0.0119	0.0136	0.0156	0.0178
1 1/2	0.0043	0.0029	0.0027	0.0041	0.0047	0.0060	0.0076	0.0091	0.0109	0.0126	0.0144	0.0165	0.0187
1 3/4	0.0049	0.0032	0.0030	0.0047	0.0053	0.0068	0.0086	0.0103	0.0122	0.0141	0.0160	0.0183	0.0206
2	0.0056	0.0038	0.0034	0.0053	0.0060	0.0076	0.0096	0.0114	0.0135	0.0155	0.0176	0.0200	0.0226
2 1/4	0.0061	0.0042	0.0038	0.0060	0.0066	0.0084	0.0105	0.0125	0.0148	0.0170	0.0192	0.0218	0.0246
2 1/2	0.0070	0.0047	0.0042	0.0066	0.0073	0.0092	0.0115	0.0136	0.0161	0.0185	0.0208	0.0236	0.0266
2 3/4	0.0077	0.0052	0.0046	0.0072	0.0079	0.0100	0.0125	0.0147	0.0174	0.0200	0.0224	0.0254	0.0284
3	0.0083	0.0056	0 0050	0.0078	0.0085	0.0108	0.0135	0.0159	0.0187	0.0213	0.0240	0.0272	0.0304
3 1/4	0.0088	0.0060	0.0054	0.0084	0.0092	0.0116	0.0144	0.0170	0.0200	0.0228	0.0256	0.0290	0.0324
3 1/2	0.0096	0.0065	0.0058	0.0090	0.0099	0.0124	0.0154	0.0181	0.0213	0.0242	0.0272	0.0308	0.0344
3 3/4	0.0103	0.0070	0.0062	0.0096	0.0105	0.0132	0.0164	0.0192	0.0226	0.0257	0.0288	0.0325	0.0362
4	0.0110	0.0074	0.0066	0.0101	0.0112	0.0139	0.0173	0.0204	0.0240	0.0272	0.0304	0.0342	0.0392
4 1/4	0.0115	0.0078	0.0070	0.0108	0.0118	0.0148	0.0183	0.0215	0.0252	0.0286	0.0320	0.0360	0.0400
4 1/2	0.0123	0.0083	0.0074	0.0113	0.0125	0.0156	0.0193	0.0226	0.0265	0.0300	0.0336	0.0378	0.0420
4 3/4	0.0130	0.0088	0.0078	0.0120	0.0131	0.0164	0.0202	0.0238	0.0278	0.0315	0.0350	0.0396	0.0440
5	0.0137	0.0092	0.0082	0.0126	0.0138	0.0171	0.0212	0.0248	0.0290	0.0330	0.0370	0.0414	0.0460
Per Inch	0.0027	0.0018	0.0016	0.0024	0.0026	0.0032	0.0039	0.0045	0.0052	0.0058	0.0064	0.0071	0.0078

STARRETT TOOLS



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TIME-DATA SHEET NO. 43

Radial Drill Press Operations—VIII

speed motors with which drill presses in the shop now are equipped, it is possible to keep the speed and feed constant. The tabulated values include ten per cent machining allowance and four per cent for cleaning and oiling.

Countersinking:

The countersinking values were established on the basis that the same speeds and feeds used for drilling would apply to countersinking. The table is compiled so that it is only necessary to know the outside diameter of the countersunk part of the hole. The time values are based on the assumption that the diameter of the hole countersunk is one-half the outside diameter of the countersink.

TABLE OF DETAIL OPERATIONS

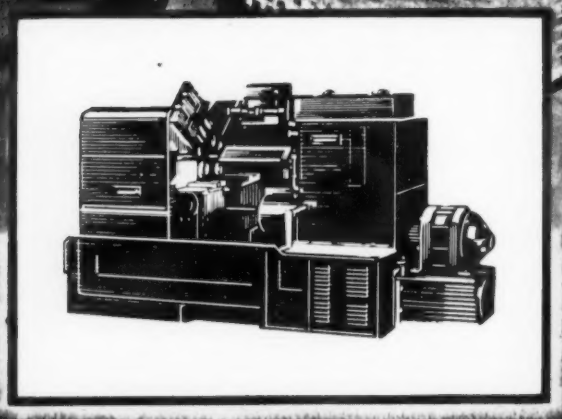
Operation Symbol	Description of Operation	Allowed Time Std. Hours
Set-up Operations		
A_2	Get job and drawing	0.0500
B_2	Study drawing	0.0141
C_2	Make out time slip	0.0178
D_2	Go to toolroom; get tools, fixture or jig	0.0865
E_2	Sort out tools, per tool	0.0113
F_2	Collect and put away tools	0.0084
G_2	Blow off table or bedplate	0.0132
H_2	Clean slots in bedplate	0.0500
J_2	Adjust machine, raise or lower arm, start and stop machine	0.0126
K_2	Put table on machine with crane	0.0512
L_2	Adjust table at angle and return	0.0438
M_2	Remove table from machine with crane	0.0512
N_2	Clean jig or fixture	0.0103
P_2	Place and clamp jig or fixture on table, by hand	0.0830
Q_2	Remove jig or fixture, release and remove clamps, by hand	0.0259
R_2	Put jig or fixture on table by hand, not clamped	0.0075
S_2	Remove jig or fixture from table by hand, not clamped	0.0036
T_2	Clean vise	0.0103
U_2	Put vise on table	0.0075
V_2	Get two clamps and clamp vise to table	0.0336
W_2	Loosen and remove vise from table	0.0115
X_2	Get bolt and place in table slot	0.0090
Y_2	Get first clamp from locker and assemble on table	0.0170
Z_2	Get each additional clamp from locker and assemble on table	0.0173
A_3	Get small angle plate and clamp on table	0.1140
B_3	Remove clamps and angle plate from table	0.0190
C_3	Clean angle plate	0.0075
D_3	Take piece and drawing to inspector	0.0058
E_3	Return to machine	0.0051
F_3	Oil machine each day	0.2000
G_3	Clean machine each week	0.4200
H_3	Go to tool rack, get very large jig or fixture with over-head crane	0.0500
J_3	Get, place and adjust parallel, per parallel	0.0062

(*To be continued*)

Table No. 7—Time To Drill Cast Iron

(*Peripheral Speed — 100 Ft. Per Min.*)

Drill Size	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3
R.P.M.	1200	1018	764	508	382	306	254	218	191	170	153	139	127
Feed	0.009	0.009	0.012	0.015	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019
Drill Lead	0.075	0.113	0.150	0.225	0.300	0.376	0.451	0.526	0.600	0.675	0.750	0.825	0.900
Depth	Allowed time in decimal hours (includes drill lead)												
1/8	0.0004	0.0005	0.0006	0.0009	0.0011	0.0017	0.0023	0.0031	0.0038	0.0048	0.0058	0.0069	0.0082
1/4	0.0005	0.0007	0.0008	0.0012	0.0015	0.0021	0.0028	0.0036	0.0045	0.0056	0.0066	0.0079	0.0092
3/8	0.0008	0.0010	0.0011	0.0016	0.0018	0.0025	0.0033	0.0042	0.0053	0.0063	0.0075	0.0088	0.0102
1/2	0.0010	0.0013	0.0014	0.0019	0.0022	0.0029	0.0038	0.0049	0.0058	0.0071	0.0083	0.0097	0.0112
5/8	0.0013	0.0016	0.0016	0.0022	0.0025	0.0033	0.0043	0.0054	0.0065	0.0078	0.0091	0.0106	0.0122
3/4	0.0015	0.0018	0.0019	0.0025	0.0028	0.0037	0.0048	0.0060	0.0072	0.0086	0.0099	0.0115	0.0132
7/8	0.0017	0.0021	0.0022	0.0029	0.0032	0.0041	0.0053	0.0066	0.0079	0.0093	0.0107	0.0124	0.0142
1	0.0020	0.0024	0.0024	0.0032	0.0035	0.0046	0.0058	0.0072	0.0085	0.0100	0.0115	0.0134	0.0152
1 1/8	0.0022	0.0026	0.0027	0.0035	0.0039	0.0050	0.0063	0.0078	0.0092	0.0108	0.0124	0.0143	0.0162
1 1/4	0.0023	0.0028	0.0029	0.0039	0.0042	0.0054	0.0068	0.0084	0.0098	0.0116	0.0132	0.0152	0.0172
1 3/8	0.0026	0.0031	0.0032	0.0042	0.0045	0.0058	0.0073	0.0088	0.0105	0.0123	0.0140	0.0161	0.0182
1 1/2	0.0028	0.0034	0.0035	0.0045	0.0049	0.0062	0.0078	0.0095	0.0111	0.0131	0.0148	0.0170	0.0192
1 3/4	0.0033	0.0039	0.0040	0.0052	0.0055	0.0070	0.0089	0.0107	0.0124	0.0146	0.0165	0.0189	0.0212
2	0.0037	0.0044	0.0045	0.0058	0.0062	0.0079	0.0098	0.0119	0.0138	0.0160	0.0181	0.0207	0.0232
2 1/4	0.0041	0.0049	0.0050	0.0065	0.0069	0.0087	0.0108	0.0130	0.0145	0.0176	0.0198	0.0226	0.0252
2 1/2	0.0046	0.0055	0.0056	0.0071	0.0075	0.0095	0.0118	0.0142	0.0164	0.0191	0.0214	0.0244	0.0272
2 3/4	0.0051	0.0060	0.0061	0.0078	0.0082	0.0103	0.0128	0.0154	0.0177	0.0206	0.0230	0.0262	0.0292
3	0.0054	0.0065	0.0066	0.0084	0.0089	0.0111	0.0138	0.0166	0.0191	0.0220	0.0248	0.0280	0.0312
3 1/4	0.0059	0.0070	0.0071	0.0091	0.0096	0.0120	0.0148	0.0178	0.0204	0.0236	0.0264	0.0303	0.0330
3 1/2	0.0064	0.0076	0.0077	0.0097	0.0103	0.0128	0.0158	0.0189	0.0217	0.0250	0.0280	0.0316	0.0350
3 3/4	0.0069	0.0081	0.0082	0.0103	0.0110	0.0136	0.0168	0.0200	0.0230	0.0266	0.0296	0.0335	0.0372
4	0.0074	0.0086	0.0087	0.0110	0.0116	0.0143	0.0178	0.0213	0.0244	0.0280	0.0314	0.0352	0.0390
4 1/4	0.0077	0.0091	0.0092	0.0116	0.0123	0.0153	0.0188	0.0224	0.0257	0.0296	0.0330	0.0370	0.0410
4 1/2	0.0082	0.0097	0.0098	0.0123	0.0130	0.0161	0.0198	0.0236	0.0270	0.0310	0.0346	0.0388	0.0430
4 3/4	0.0087	0.0102	0.0103	0.0129	0.0136	0.0169	0.0208	0.0248	0.0283	0.0326	0.0362	0.0406	0.0450
5	0.0092	0.0108	0.0108	0.0136	0.0143	0.0176	0.0218	0.0260	0.0297	0.0340	0.0380	0.0430	0.0470
Per Inch	0.0018	0.0021	0.0021	0.0026	0.0027	0.0033	0.0040	0.0047	0.0053	0.0060	0.0066	0.0073	0.0080



THE STUFF VICTORIES ARE MADE OF . . . . .

● Our men in Africa, the South Pacific and other fronts need the help of both men and machines that *stay on the job.* Neither can do without the other. You can count on your New Britains. Can they count on you? Absentees win no wars.

ARMY E NAVY

NEW BRITAIN-GRIDLEY • MACHINE DIVISION
THE NEW BRITAIN MACHINE CO. • NEW BRITAIN, CONN.

NEW BRITAIN AUTOMATICS

Suppose You Had To

SUPPOSE YOU are so close to the enemy that he can bomb the daylights out of you. Hence you are forced to alter your long-accustomed manner of conducting your war business.

You do a lot of things that in your wildest dreams you never thought of doing. You lug heavy machine tools from existing factories and install them along seven miles of an abandoned underground railroad tube far enough down that air raids won't interrupt production.

And, by the way, how would you like to run a machine shop seven miles long and the width of a railroad track or two?

You put an airplane engine factory 150 ft. down in the bowels of the earth, occupying a spot that at one time was an old quarry.

You don't dare concentrate manufacture in one spot, utilizing the best mass production technique, because then you would be a tempting target for bombers. You are driven to dispersal of your operations around the country, where dropping of "eggs" can't disrupt output of war goods so badly.

Hundreds of thousands of your people go to work before dawn, are inside at their machines all through the daylight hours and go home when darkness is rapidly descending, scarcely ever getting a glimpse of the sunshine for six days at a stretch, week after week.

Women are performing every kind of service. Those from 18 to 22 years of age are in the military establishments or in munitions plants. Those 23 to 45 years of age, except women with young children, are at work in some essential undertaking.

You look upon unexcused absenteeism as an act to be more than deplored. Chronic offenders are summoned before the worker-management committees of your factories for punishment.

You discover it more productive and less costly to operate your plants from Sunday mornings to Friday nights, with Saturdays off, than to run on the traditional Monday-through-Saturday schedule, though you must pay double time on Sundays.

Despite these vexing problems, plus many more not mentioned, you have the foresight to make the most of your limited human resources. You can't afford to waste them, to dilly-dally or to postpone vital decisions, because your life is at stake. The enemy is just outside.

You treat agriculture as a deferred occupation. You have retained skilled farmers on the land to raise the food to help feed you. As a result manpower for your farms is not a critical issue.

Workers in war factories as a group, 21 to 38 years of age, are deferred on the same principle. If they are needed by the army or navy, they are taken progressively by years, starting with the youngest. Men of 20 are the first to go, then men of 21, then men of 22, and so on.

You, needless to say, are England at war. You have done these things because you have been blitzed. You know from bitter and tragic experience. The Nazis, to your discomfort, are still sitting on your doorstep trying to gain admittance. Your blackouts are the real thing and bear no resemblance whatever to the occasional rehearsals on our own eastern shores.

You will be pardoned if you politely conceal either a smile or an expression of annoyance at all our talk and confusion and seeming lack of definite policy regarding utilization of manpower.

You will be further pardoned if you whisper to us, "I don't want to butt into your affairs, old boy, but I can't help saying to you privately that you'll know what a manpower problem really is when you get in our fix.

"Don't you think it is high time to cut out the nonsense, as we have done, and get down to the business of winning the war?"

Burnham Finney

GAGING BUSINESS

As appetites of productions lines grow, raw material shortages become worse; drastic steps will be taken. Production will be trimmed to prevent piling-up. Extensive use of machine tool builders plants to make war goods, seen

Raw Materials Shortage Acute Shortages of raw materials are steadily becoming worse and prospects are that they soon will be more serious than lack of manpower as a brake on war production. Two factors are responsible for this situation. One is that many plants are turning out far more than they did a short time ago with little increase in floor space and machinery. An airplane engine factory, for example, was turning out 700 units a month early in 1942. Today it is producing nearly 2,000 units a month in about the same manufacturing space and with about the same equipment. The other factor is the tremendous upping of production goals, especially in aircraft and in shipping.

Drastic Steps Will Be Taken Drastic steps to avoid critical shortages of materials cannot be avoided. Government pressure will be applied to management to speed up production processes, such as operating rates of blast furnaces. The bringing in of many marginal and sub-marginal ore mines is contemplated. The policy will be to get the materials regardless of the cost and of the effects on postwar business. The Controlled Materials Plan will be retained, but extensive changes will be made in its application. It is believed that the original plan will hardly be recognizable by the end of the year. Meanwhile the War Production Board is making good progress in getting the plan into operation.

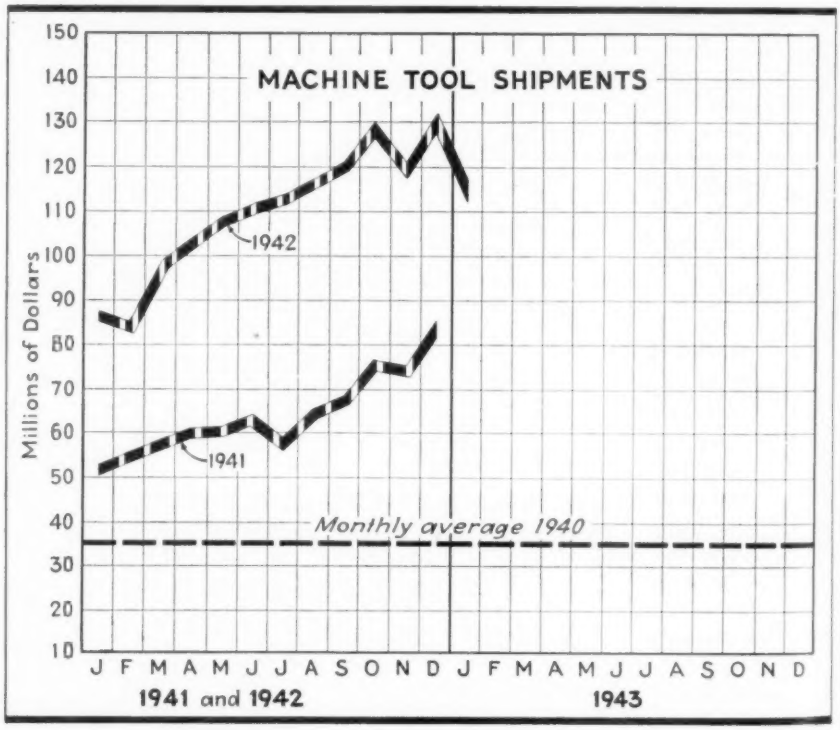
Will Reduce to Fit Need Extensive cutting back of some lines of war production may be expected in the near future. Further piling up of munitions and supplies that cannot be shipped overseas for an indefinite period is certain unless curtailment of output is ordered. It can correctly be stated, however, that supplies are reaching General Eisenhower's forces in north Africa faster than they can be absorbed. At the same time, the big bottleneck in 1943 is ship tonnage and proper protection for the shipping. It is believed that Hitler intends to put twice the number of U-boats in the Atlantic this year as last.

Distribution and not production henceforth will be the chief problem in connection with munitions supplies. Output has been impressive. In the first two months of this year over 10,000 planes have been produced, with the percentage of combat planes to total production growing constantly as the months speed by.

Consider Using Tool Plants Widespread utilization of the plants of machine tool builders to produce war goods is in the forefront of WPB executive thinking. This policy also applies to other companies making factory equipment for which the demand is expected to taper fast under the restriction-of-expansion policy now being stressed. The plan is to get critical war items scheduled for such plants long enough in advance of the drop in their regular lines to keep them hot and their working forces and production facilities intact.

Tool Production May Slump Soon Machine tool production is staying up around $120,000,000 a month, though it is likely to slump from that point soon. New business is not coming in at the former rate. A surprisingly large amount of orders, however, is yet to be placed. The bulk of unplaced business is for the airplane expansion program. Both England and Russia are clamoring for deliveries of machine tools, the latter in particular pressing for speedy help. Cancellations are not so great as they were. Pool orders still are being authorized by WPB, but on an exceedingly cautious basis. Backlogs of individual builders, even those of companies making the same types of tools, vary considerably. On the whole, deliveries are shorter than they have been for two years or more.

High government officials cling to the opinion expressed earlier that total machine tool output this year will not decline much more than 10 percent from the level attained in 1942, when production climbed to $1,360,000,000. Last year, however, operations trended upward all year, whereas this year output will head in the opposite direction. Machine tool builders are losing men far more rapidly than ever before to the services, the result being a serious deterrent to production of machines vitally required in the war effort.



Anticlimax—After the end-of-the-year rush to fill orders had boosted December machine tool shipments to $131,960,000, January shipments saw a reduction by 11 percent to $117,432,000. The backlog of orders shows an 8.1 percent drop in value from the December figure. Average time required to complete unfilled orders was 6.8 months the end of January as against 6.5 months the end of December

Fluidity Will Continue to Mark Administration of CMP

Controlled Materials Plan has been changing faster than producers can familiarize themselves with it, and will continue to do so. Latest revisions are toward simplification

BY ROBERT COLBORN

WASHINGTON—The curse of the Controlled Materials Plan, from the point of view of the firm trying to work under it, has been that the plan won't stay put. Every week, sometimes it seems every day, brings new detailed regulations.

You should expect changes to continue. The first big change in the basic philosophy of the plan is due any day now—elimination of the Class B products. These more or less standard commercial goods and components entering into a multitude of items will be placed under a somewhat modified version of the old Production Requirements Plan. Class A items will continue under CMP.

Should Learn the Details

Despite changes, industry has got to live with the plan. Metal-using firms should familiarize themselves with the latest version of the basic CMP regulation, No. 1 and with reg. 2, inventories; reg. 3, use of preference ratings; reg. 4, warehouses and distributors; reg. 5, maintenance, repair, and operating supplies. A forthcoming reg. 6 will cover construction, and reg. 7 consolidates some of the certification requirements of the other regulations.

Meanwhile, businessmen generally should be aware of some of the more important procedural changes, which these regulations make, most of them simplifying paper work.

Originally, although allotments of controlled materials were to be made every three months, the requirements for each month were to be allotted separately and identified by a separate allotment number. The number would consist of a letter identifying the claimant agency, four digits identifying the agency's production program, three digits identifying the producers production schedule, and two digits identifying the month (numbering from January, 1942). Thus a war department allotment for April, 1943 might read W-1234-567-16.

New Plan is Simpler

Under the revised plan, a single allotment will cover the entire requirements for a quarter and will be identified by the number of the first month of the quarter. Producers are allowed to purchase a third of their allotment of controlled materials in each month. Since a producer is required to keep a detailed account of his use of each allotment, this simplifies paperwork considerably.

There's even more saving in the provisions by which prime contractors can basket the allotments they receive. In passing on part of his allotment to his sub-contractors, the contractor need not specify in detail which allotment he is passing on. All he needs give is the claimant agency, the first digit of the program number, and the quarter. Thus, the allotment number given above would be passed on simply as W-1-16. This means that for most purposes, a prime contractor can treat as one all allotments he receives from an agency.

Delivery Date is Schedule

In passing on an allotment, the prime must still obtain from his sub an application on form CMP-4A specifying the production schedule for which the material is to be used. Even this is simplified by a rule that a mere delivery date on a contract may be deemed to constitute a production schedule.

Where the sub-contract is small, no application form need be required from the sub or any other formalities. In orders below specified limits, the prime merely notifies the supplier of the number of the applicable allotment and adds the letters SO. The supplier baskets all such small orders he receives, and in ordering the controlled materials he needs, merely certifies that the order is supported by SO allotments.

Distributors handling Class A products containing controlled materials are permitted to buy and sell them without allotment numbers. The manufacturer of the products obtains an allotment of materials from WPB just as if he were making Class B goods.

Contractors who are backed by a long chain of sub-contractors and sub-subs can eliminate a great deal of paper-handling by the use of an alternative procedure (Reg. 1 (r)) under which he constitutes himself a sort of private WPB. He himself makes direct allotments to all his subs, sub-subs, sub-sub-subs, etc., rather than passing them down from sub to sub-sub, etc.

Hold Inventory to 60 Days

Regulation 2 forbids anyone to take delivery of controlled materials which would raise his inventory above a 60-day level. Exception is made for deliveries made ahead of schedule by the supplier and where this rule would require impracticable small deliveries.

Steel warehouses and distributors, according to reg. 4 deliver on allotment numbers. In addition, they may fill any order amounting to less than $10 and may deliver to any customer who certifies that his quarterly use does not exceed a specified amount.

Press Ass'n.

On the Land and on the Sea—Ford's new quarter-ton four-wheel drive amphibian, already in use by U. S. forces in the war zones, is really a truck with a boat built around it. Equally at home on land or in the water, it can pull itself up steep banks with a power-driven winch built into its prow

MRO Regulations Defined

Anyone whose need for controlled materials in their basic form for use as maintenance, repair, and operating supplies (MRO) falls within the amounts which can be delivered by warehouses without allotment numbers should get them in that manner. As to larger users, Reg. 5 lists the essential industries in two groups. Any industry included in one of the lists may buy controlled materials for MRO in amounts up to the dollar rate of expenditure for MRO during 1942 merely by certifying that the order is for MRO. Such a certification will have the same standing as an allotment number. To buy fabricated products or non-controlled materials, up to the same quantity limit, industries in group I may use a rating of AA-1, industries in Group II of AA-2X, and other industries of A-10. Anyone who wants to buy MRO at more than the 1942 rate must apply to WPB.

Producer Computes Rates Under the Revised E-1-B

WASHINGTON—Revision of machine tool allocation order E-1-B permits the individual producer to calculate his own percentages of production to be scheduled to the various service groups. Before the revision, the machine tool division had to take the extra step of translating the over-all percentages into individual scheduling percentages.

Each producer bases his calculations on his record of deliveries to the service groups, so that his schedule can be adjusted to meet his own situation.

The revision helps the users of machine tools to get more of the kinds of tools they want from the manufacturers they are accustomed to dealing with, and this adds to the efficiency of end production for war.

Unassigned tools, under the revised order, go to the purchasers having the lowest schedule of deliveries. This is rather surprising at first thought. The idea is that a few extra tools might make the difference between going ahead and not going ahead to the purchasers with low delivery schedules. A few extra tools are not likely to make much difference to the purchasers whose schedules are heavy.

Exhibit A, the list of tools by types, 52 in all, included with the amended order, has been revised. Dividing and measuring machines have been removed from the list, and are part of order E-9.

Officers of the Machine Tool Division told AMERICAN MACHINIST that they realized the order is pretty hard reading, but that they had made it as simple as they possibly could. They said they felt that, while it sounds intricate to casual observers, nearly all machine tool companies have on their staffs persons who are used to this kind of thing and will have little or no difficulty with it. The division submitted with the order an illustration of a producer's work sheet for determining service group quotas for May, June and July.

Asked why they did not italicize the new text in the order, so that readers could readily spot changes from the text of old E-1-B, division officials said that the revision is a general re-write, and is full of changes all the way through. They would have had more italic than roman text. Therefore, it would seem necessary for all persons concerned to study the entire order.

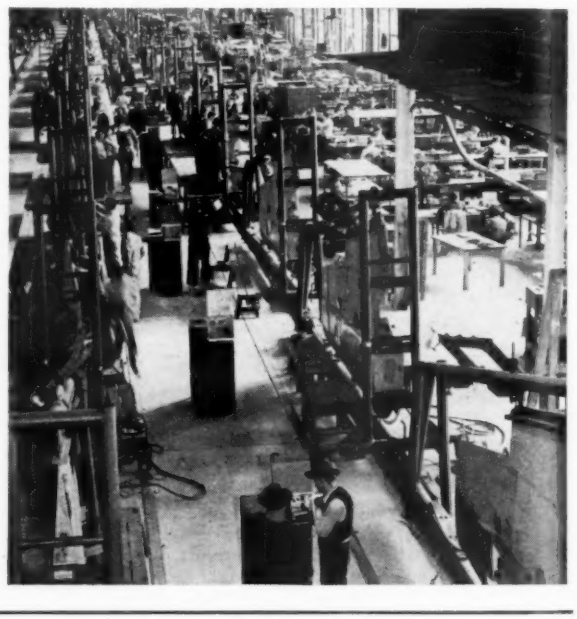
In addition to their basis on individual backlogs, the new scheduling depends also upon urgency standing of each contractor and upon required delivery dates of orders for specified sizes and types. Machine tool is defined as any non-portable, power-driven metal-working machine named on list A of the order. Existing schedules are frozen until May 1, 1943; new provisions of the order affect deliveries after that date.

Wilson Increases Control With Component Scheduling

WASHINGTON—Production and purchasing of the all-important parts, components, that enter into the production of many war goods was brought under complete WPB control when Vice-Chairman Charles Wilson issued a broad order covering the scheduling of "critical, common components." A critical component is one in which production is less than demand. A common one is one entering many items.

The order, M-293, asserts Wilson's intention to assume full responsibility for assigning orders for components wherever necessary—at the moment, to a few items: certain compressors, heat exchangers, turbo-blowers, industrial jewels, radio test equipment, and machetes. Lesser controls are imposed

(*Continued on page* 124f)



Wings and the Women — Approximately 80 percent of the work of building Army P-39 Airacobra wings, performed on constant-motion lines at Bell Aircraft Corp., is now done by women workers. The wings are constructed in giant master fixtures which move steadily forward on power-driven lines. Great savings of time and effort result from the use of the single fixture instead of the four previously used

A.S.T.E. Show Exhibitors To Feature New Techniques

DETROIT—Hundreds of new developments to simplify and expedite the war production job will be shown at the 1943 Machine & Tool Progress Exhibition of the American Society of Tool Engineers, Milwaukee, March 25-27.

An entirely new process for assembling of aircraft structures, which works through induction heating, will be revealed. Details of a method of producing steel gears without machining will be set forth by another exhibitor. A method which enables the restoring of worn out cutting tools, giving them a longer life than they possessed when new, will be demonstrated.

Applications for exhibit space have been approved for and booths assigned to the following organizations:

Alloy-Sprayer Co., Booth 120; American Machinist, 11; Ampco Metal Co., 10; Anderson & Sons, 61; Anker Holth Mfg. Co., 97; R. B. Annis Co., 94; Aro Equipment Co., 31; E. C. Atkins & Co., 34; Automotive & Aviation Industries, 2; Bakewell Mfg. Co., 130 & 131; W. O. Barnes, 59; Black Drill Co., 107 & 108; Blank & Buxton Machinery Co., 139; Henry Boggis & Co. and Cleveland Tool Eng. Co., 1; Boice Crane Co., 106; Bokum Tool Co., 5; Boyar Schultz Corp., 29; Bradley Machinery Co., 18 & 19; Bridgeport Machines, Inc., 62.

Charles Bruning Co., 67; Capewell Manufacturing Co., 142; Carboloy Co., 70 & 71; Carpenter Steel Co., 111 & 112; Chicago Mfg. & Distributing Co., 80; Cincinnati Tool Co., 42; Conant Tool & Engineering Co., 118; Continental Machines, Inc., 49, 50 & 51; Davis Boring Tool Division, 60; Deepfreeze Div., Motor Products Corp., 40; Delta Mfg. Co., 56, 57 & 58; Detroit Power Screwdriver Co., 87; Detroit Stamping Co., 33; Detroit Universal Duplicator Co., 63 & 64; DeWalt Products Corp., 72 & 73; The Dumore Co., 89; Durant Mfg. Co., 4.

East Shore Machine Products Co., 132; Edward Blake Co., 95 & 96; Engineering Sales Co., 76; Eutectic Welding Alloys Co., 135 & 136; Firth-Sterling Steel Co., 140; Ford Motor Co., 102; Gairing Tool Co., 66; Gammons-Hoaglund Co., 35; General Machine Tool Co., 129; Genesee Tool Co., 116; Gillman Engineering Works, 100; Gorham Tool Co., 90; Gray-Mills Co., 144; Grinding Machinery Co., 123; Grob Brothers, 78 & 79.

H. & H. Research Co., 16; Hammond Machinery Builders, Inc., 47 & 48; Hardinge Brothers, Inc., 32; Huot Mfg. Co., 75; Ideal Commutator Dresser Co., 133; Charles L. Jarvis Co., 83; Johnson Gas Appliance Co., 69; Knu-Vise, Inc., 36 & 37; Koebel Diamond Tool Co., & Standard Gage, 7, 8 & 9.

LaSalle Designing Co., 122; Link Engineering Co., 77; Lipe-Rollway Corp., 113 & 114; Madison Mfg. Co., 43; Majestic Tool & Mfg. Co., 46; McCaskey Register Co., 38; McKenna Metals Co., 84; Michigan Tool Co., 109 & 110; Micromatic Hone Corp., 68.

National Broach & Machine Co., 14 & 15; National Tool Salvage Co., 30; W. H. Nichols & Son, 22; O'Neil-Irwin Mfg. Co., 81; Pate Oil Co., 39; Physicists' Research, 82; Pioneer Pump & Mfg. Co., 137; Porter Cable Machine Co., 127 & 128; Portman Machine Tool Co., 52; Progressive Welder Co., 24 & 25.

Racine Tool & Machinery Co., 27; Ransome Machinery Co., 3; Reliable Tool & Machine Works, 17; L. L. Richards Machinery Co., 141; David J. Ross Co., 98; Ross Operating Valve Co., 121; Sav-Way Industries, 124, 125 & 126; Schauer Machine Co., 55; George Scherr Co., 23; Claude B. Schneible Co., 143; Screw Machine Engineering, 41; Severance Tool Industries, 65; Snyder Tool & Engineering Co., 88; Stokerunit Corp., 91, 92, 93, 103, 104 & 105; D. A. Stuart Oil Co., 138; Super Tool Co., 53 & 54; Swedish Gage Co. of America, 101.

Techtmann Industries, Inc., 28; Ultra-Lap Machine Co., 20 & 21; Van Norman Machine Tool Co., 74; Vaccoloy-Ramet Mfg. Corp., 13; Vickers, Inc., 85 & 86; Wells Mfg. Corp., 45; Wetmore Reamer Co., 6; Whirlwind Lawnmower Corp., 119; Willis Stutson Associates, 117; Wilson Mechanical Instrument Co., 115.

Automotive Council Seeks Manpower Shortage Solution

C. E. Wilson heads committee to explore 48-hour work week, absenteeism and incentive systems. Longer week to bring only 15,000 into Detroit plants, admits regional chief

INSIDE DETROIT By Siler Freeman

DETROIT—Having licked at least two of its biggest production bottlenecks to date, machines and materials, the auto industry has turned its full attention and ingenuity on another. Although it has not heretofore acknowledged that manpower was a current problem, the industry now has gone as far as to say it may soon become one and wants to be prepared.

Will Investigate Four Sources

The preparation has taken the form of an industry-wide committee, headed by C. E. Wilson, president of General Motors, which will seek out the facts, pool its experience and try to develop greater productivity from the available manpower. As outlined by Wilson in accepting the chairmanship of the Manpower Utilization Committee of the Automotive Council for War Production, the committee will delve into four possibilities.

1. Increased use of women in plants.
2. Longer work week.
3. Return of incentive plans.
4. Selling productivity to workers.

On the latter point, Wilson explained that he believed almost all workers want to produce more. Some do not understand the problem.

"We will have to improve the attitude and understanding of the few who stand in the way of increased production," stated Wilson.

The longer work week stood out as one of the best methods of increasing utilization of manpower, according to Wilson, but he limited the possibility to 60 hours. Wilson has always contended that the war can not be won with a 40-hour week. But—

"There is little work I would care to operate more than 60 hours."

In this, Wilson goes along with England's experience in working hours.

Incentive Plans Are Dynamite

The return of incentive plans was something which Wilson skirted delicately. It is a subject that is full of dynamite, as was shown by split in the ranks of the CIO when it was brought up at the Columbus meeting.

Wilson pointed out that the employment of women had not yet reached its peak. The same reaction was found in the Detroit regional Manpower Commission where methods are being studied to get more women to take part time and full time jobs in industry.

One of the problems to be studied by the Manpower Utilization Committee will be that of absenteeism.

Believe Problem Exaggerated

"I believe this problem has been greatly exaggerated," stated Wilson, but we are looking for improvement in that direction. Getting the right man in the right job should reduce absenteeism."

Recently, Col. George E. Strong, internal security chief for the Central Procurement District of the Army Air Forces, suggested a manpower pool to utilize idle workers, even for short intervals. But Wilson took exception to this suggestion. He said an orderly basis to transfer workers from one plant to another would be sought by his committee.

"I don't think it is effective to move men around arbitrarily," stated Wilson. "At the same time, you should not freeze a man to his job or to transfer him from a job he likes to one he does not like."

Wilson scoffed at charges that industry was hoading labor. The unions, however, are still sniping with that one.

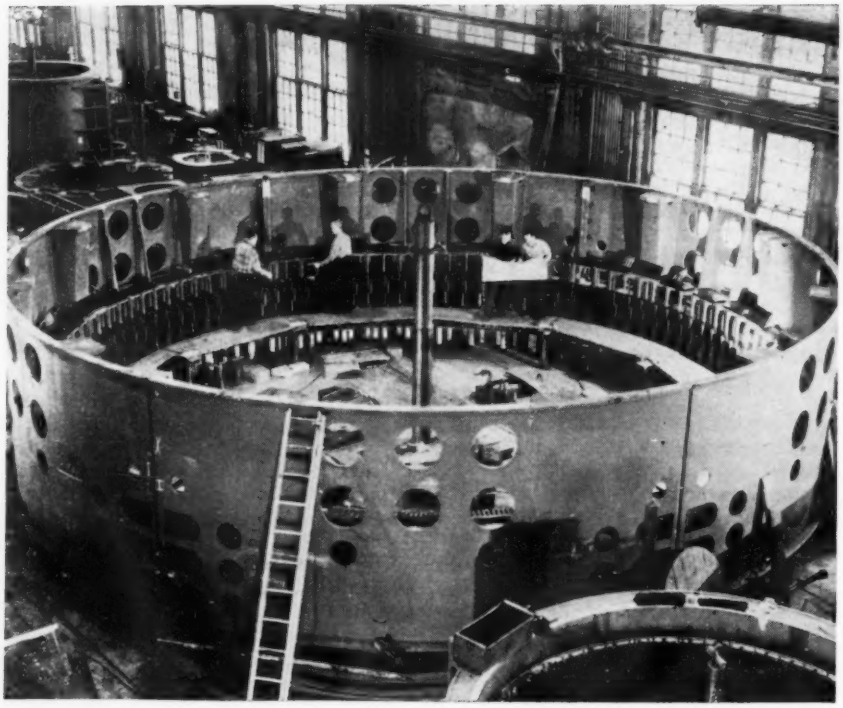
Idea Exchange Was Profitable

Pooling and exchange of ideas in the industry brought order out of chaos in shifting machines where they were most needed. It solved material shortages and brought about shortcuts in production and substitutes that proved as good if not better than the original materials.

But the approaching manpower crisis is another thing. Men cannot be shifted like machines, as Wilson admitted. Workers are still afraid of working themselves out of jobs by attaining too efficient production.

However, the Council has a long record of achievements in war work. Wilson and the members of his committee are all executives who have won their spurs by doing. So more effective use of manpower may be achieved

Land Cruiser Nears Launching—The Army's newest offensive weapon for land fighting, a "tank destroyer," is in mass production at the tank arsenal of the Fisher Body Division of General Motors. Designed with sufficient speed and firepower to seek out and demolish any armed vehicle of the enemy, the new destroyer already has been tested in battle. It is of welded construction and is faster than the ordinary tank. It has a lower silhouette than a tank



One of the Big Ten—The stator core for the tenth General Electric water-wheel-driven generator for Bonneville dam nears completion. Approximately 41 ft. in diameter, this frame is believed to be the largest in the world. This generator, rated 60,000 kva., duplicates seven other units while the first two in the station were rated 48,000 kva. each. When the last unit is complete later this year, the total installed capacity at Bonneville will be 581,000 kva.

before July or August when the pinch in labor is expected.

Expect Little of 48-Hour Week

The 48-hour work week, which is to be in operation in the Detroit area by the end of March, will do little to meet the expected shortages, Montague A. Clark, WMC regional chief here, admits. He estimates that only 15,000 will be added to the labor pool by putting in the longer work week.

To get the 15,000 into essential industries, 100,000 workers will have to be shifted around, according to Clark's figures. Considering that there are 1,100,000 now employed in the Detroit area, this appears to be just a stir.

Meanwhile Clark and his labor-management advisory committee are in a stew about how to put the 48-hour week into effect without dislocating employment.

Clark wants workers to get "leaves of absences" so that they may return to their old jobs when the emergency is over. He also wants seniority rights protected by the shifting of the workers. Two meetings with his advisory committee have failed to show how this will be brought about.

Seek Uniform Gaging

A move to make uniform gaging practices employed in inspection of precision parts for war equipment was started by the Automotive Council for War Production. It proposes that the American Standards Association undertake an intensified standardization program for all American industry.

The move is intended to speed the development of a new standard for a specifying fits and tolerances and methods of gaging inspection and gage control. The actual development work would be conducted by the American Standards Association and would be in cooperation with the WPB.

Wilson Increases Control

(*Continued from page* 124d)

on the rest of the 32 items which have been designated as critical and common.

These 32 components are important, representing the last production bottlenecks of a purely manufacturing nature, limited by the sheer inability to make them fast enough. Short supply of them holds up all of the important programs—and effort to step them up is well repaid.

These components occupy a strategic place in Wilson's drive to put war production generally on a scheduled basis. In order to rationalize the output of the components, he must know the demand. And before the services can tell him the demand, they have to schedule the production of war goods and parts thereof. This was the thinking behind last month's Feb. 6 deadline on placing of component orders.

M-293 requires producers of all the 32 critical components to report monthly to their industry divisions: 1. Their production capacity; 2. Total unfilled orders; 3. Orders received; 4. Orders cancelled; 5. Orders scheduled for production; 6. Shipments made. In addition, two other methods of production-control are provided by the order.

One is freezing of order boards. Manufacturers of items getting this treatment, known as Class X, are required to submit at the beginning of each month a schedule of the deliveries they propose to make during the month. Once approved it is frozen.

More drastic is the second method, labelled order-sifting. Before anyone can order an item in Class Y, he must ask permission of WPB's industry divisions. WPB will decide with whom the order is to be placed and where it is to be fitted into the production schedule. Thus, WPB is in a position to level out the order boards of the different manufacturers.

WAR RULINGS IN BRIEF

Checklist of Significant Regulations on Materials and Prices

AUTOMOTIVE PARTS — Restrictions on use of copper and copper base alloy products in manufacture of these parts have been extended. These critical materials may not be used in the manufacture of the parts (including replacement parts) except 15 specified items. (Amendment to Limitation Order L-106.)

CERTIFICATION FORM—Use of forthcoming single standard form to validate any delivery order under Controlled Materials Plan will obviate necessity of placing several different certifications on a single order. (Regulation 7.)

COPPER—Use of this metal for alloying with silver is prohibited except on orders rated A-1-a or higher or with specific authorization of director general for operations. Copper scrap and copper base alloy scrap containing 0.1 percent or more beryllium can be delivered only to persons specifically authorized by WPB. (Supplementary Order M-9-b, Amended.)

ENGINES—Number of air cooled engines that can be produced, except those for aircraft and motorcycle propulsion, is now placed under control, and standardization and simplification practices have been established which decrease materially the number of replacement parts. (Limitation Order L-254.)

MAINTENANCE EQUIPMENT—Interpretation points out the cranes, monorails and similar equipment costing less than $200, intended to replace existing equipment or for minor relocation of plant machinery, may be considered minor capital equipment; that costing over $500 is not so considered. (Interpretation Priorities Regulation 11.)

WARTIME WASHINGTON

BY BLAINE STUBBLEFIELD

With the war machine reaching saturation, some civilian material production will increase. Congress is showing little enthusiasm for anti-strike legislation. Plane makers dream of post war auto. War production figures no longer secret

To Manufacture Civilian Goods Businessmen should be preparing for a revival of some civilian goods manufacturing by fall of this year. About that time arms production will have completed the job of catching up after the long years of peace, will have equipped an army and can go on a maintenance basis.

Production is within a few months of going over the hump and will decline somewhat thereafter. Aircraft is an exception, will continue to rise for about a year, but most other goods will reach their scheduled peaks in late summer and fall; tank output is already declining from a December peak.

War Production Will Decline At the same time that maximum output is being achieved, the demand for armament may slack off somewhat. Up to now we have been filling the unbelievably capacious pipeline to the battlefield: huge new levies of men have had to be equipped, and the mere accumulation of in-transit inventories took enormous quantities of goods. The faster goods could be fed into the pipe, the sooner it would be filled, and the demand was therefore practically unlimited. By fall, the stuff will be gushing out at the battlefield end as fast as it's fed in at the factory.

Battle Needs Set Production Then there'll be no sense in making more guns than can be shot at the enemy. The actual needs of battle will dictate the rate of production—and it'll be a less than peak rate. This won't mean immediate demobilization of the economy, elimination of war controls. But it may mean practical demobilization for many individual firms. For some firms it will mean disaster, as war contracts are cancelled; for others it may present an opportunity as raw materials are released to civilian use.

Anti-Strike Law Seems Unlikely Anti-strike legislation is still largely talk. Congressional sponsors of the dozen or more bills aimed at halting strikes, such as the Connally bill requiring government seizure of struck plants admit privately that little sentiment for such legislation has materialized yet. Most of the bills were revived during threats of a strike in western plane plants. Sponsors anticipate a coal strike next month, however, which they believe would rapidly crystallize sentiment in Congress for drastic legislation.

Will Shelve Hobbs Bill The Senate, which has been more reluctant to adopt legislation opposed by organized labor than the House, is expected to pigeon-hole the Hobbs bill after it passes the House. This will depend on the subsequent activities of labor unions themselves.

Plane Makers Plan Autos It's no secret that several aircraft companies have designs on their drawing boards for new-type autos with which to invade the postwar market. Not many people know, however, that one big wartime operator outside the auto industry has already hand-built two specimen postwar cars. One is a conventional design of Cadillac quality and weight, with an in-line engine—to sell for $1,000. The other is an aluminum and magnesium job weighing only 1,300 lbs., utilizing a small high-compression engine, not yet built, to run on 100-octane gas; it's supposed to sell for $900.

Secrecy Gone, Publicity Here War production rates are now passing out of the secrecy stage into the publicity stage. For three months the War Department or OWI has been announcing the monthly output of airplanes, and the last time even breaking the figure down to the extent of saying 65 percent of the total 5,000 in January was combat.

Whereas for a year after Pearl Harbor, Washington publicized production in percentage figures, or merely mentioned the name of the item, and in some cases said nothing, now, you are hearing more and more numbers.

For the first time, War Information tells the monthly (January) output of carbines, 58,000; Garand rifles, 80,000; 27,000 .50 caliber machine guns for mounting in airplanes; 7,000 20 millimeter aircraft cannon, and 68,000 submachine guns.

Big Figures Scare Him In the early stages, the managers of this war played poker with their statistics. They had very little of anything, and the enemy would be comforted to know it. But they might have an effective supply of something, with which to surprise him. Now, they tell him the numbers which put fear and discouragement in his heart.

Undersecretary of War Robert Patterson told the press that in January we produced 70,000 aircraft bombs of 1000 pounds or larger size, enough, he said, to drop 2,300 a day on the enemy for 30 days. Lately, officials have mentioned the number of destroyer escort vessels programmed, not for publication.

American industry produced 1,932,000 high explosive shells of all calibers in February, and 419,000 bombs of all sizes up to block busters.

February production figures included 8,000 aircraft cannon, 2,000 anti-aircraft guns and 7,800 weapon-bearing combat vehicles in January and February together. The output of small arms ammunition amounted to 1,244,000 cartridges—500 every second. American shops produced 150,000 machine guns and 134,000 sub-machine guns. In two months the country produced 5,000 tanks and more than 28,000 anti-tank guns.

AIRCRAFT PRODUCTION CZAR

WASHINGTON—T. P. Wright, civilian aeronautical engineer has been granted sweeping powers as Director of the Aircraft Resources Control Office, by a directive from the Aircraft Production Board. The production board, headed by Charles E. Wilson, executive vice chairman of the War Production

THEODORE P. WRIGHT

Board, is the policy-making unit in the aircraft set-up, while the resources control office is the executive operating unit.

While opposed to civilian authority over military production, the Army Air Forces' materiel command and the Navy Bureau of Aeronautics were represented as feeling that the choice of Mr. Wright is a happy one.

After Year of Enormous Growth, Canadian War Production Is Expected to Level Off

OTTAWA—With output now at the rate of $3.7 billions a year, little expansion in Canada's war production capacity is in sight for the next few months. Present rate of production places the Dominion in fourth place among the United Nations as a source of war supplies. War contracts to a total monetary value of over $6.5 billions have been placed in Canada since the start of the war, the bulk of the total being on Canadian government account and the remainder largely on United Kingdom account but with some large contracts on United States account. Contracts for plant construction and extension are included in the total. Canadian industrial capacity has been raised by a value of $1 billion through expansion of war production and over 4,000 plants are now manufacturing war goods and employing a million workers as compared with 300,000 in the first year of the war. Only two of these plants were producing the same kind of goods three years ago.

From Too Little to Surplus

Canadian war production in the first quarter of 1943 is featured by the position in regard to machine tools. It represents the outcome of what might be termed an industrial revolution. In the early years of the war effort machine tools were the greatest production problem, because Canada had depended almost entirely on the United States and Great Britain for such equipment for her industry. This year Canadian plants are supplying a large part of the country's requirements and surpluses in several lines of machine tool equipment are being exported to Great Britain, other Empire countries, the United States and Russia. Single-purpose shell lathes in particular have been supplied to Britain and the United States while quantities of general purpose machines have gone to different Empire countries.

Of 21 different items of standard machine tool equipment now being made in Canada only 7 were made here before the war. Items in which successful production has been achieved after a start from scratch include gun boring, gun rifling, gun turning machines, cartridge case lathes, horizontal milling machines as well as profile and thread milling machines, vertical shapers, contour profile grinders, single-purpose bomb turning machines, thread chasing machines, various types of small arms ammunition machines and cutter and tool grinders.

Developed Ordnance Industry

This development in the machine tools division of Canada's war effort is an important factor in an ordnance industry that started from nothing to become one of the most important departments of the Dominion's war production. Without facilities three years ago for making a single gun barrel, Canadian plants are now producing artillery and naval guns, carriages and mountings, at a rate that is a considerable item in the supply of United Nations' requirements. Associated with the development in heavy ordnance is an increasing output of fire control instruments, many of them originating in the laboratories of Canada's National Research Council and representing advanced scientific findings; some are United Nations' war secrets.

Production Octupled in Year

Large plants which have come into production in the last three years are turning out Bren guns, Browning machine guns, Sten machine carbines, rifles and other small arms in a volume which has now reached the rate of one unit a minute for every minute of a seven day week. Twelve types of small arms are being shipped to fifty destinations on the fighting fronts of every continent. Production in this field rose from $22 millions in 1941 to $186 millions in 1942 and will be heavily increased this year.

Output of armored combat vehicles is being stepped up this year within existing capacity after having been increased last year to eight times that of the previous year. Production of mechanical transport in Canadian plants is now at the rate of well over $400 millions a year.

Marching as to War—B-25 bombers, "Billy Mitchells," parade down the assembly line of North American Aviation plant, in various stages of construction, above. These ships are said to have no equal in their class. At the left, a B-25 begins to take shape. Much of North American's speed in production is attributed to use of a system of major unit subassembly

THE AIRCRAFT HORIZON

Plane producers say absenteeism over-emphasized. Truman Committee judges lagging plants by comparison with leaders. 150,000 planes '44 goal. Army buys helicopters

Washington's bureaucrats are over-emphasizing the problem of absentee workers so far as the aircraft industry is concerned. Some aircraft plant managements believe that Washington is doing more harm than good with their threatening, platitudinous speeches. Fact is that not one single aircraft has been "lost" due to absenteeism, because none of the airframe producers has had the materials from which to make any more planes than he has made.

Another fact is, and this is pointed out by the Aircraft War Production Council of Southern California (which incidentally is producing about 20 percent of the total war production program) that most "absenteeism" is not willful on the part of the workers. Half of them are women, who are not physically capable of staying on such jobs consistently; there is transportation trouble; there is drunkenness caused by boredom which is caused by lack of recreation facilities; time off is taken for shopping because stores close at night; there is no one to care for baby.

The Aircraft Council says that most absentee trouble rests on the shoulders of employers themselves. They could not foresee these difficulties; they had never done such a job before. Now, they would like to be permitted to work their way out of it. They would like to hear less inflamatory speeches and get more constructive assistance.

Absenteeism (an unfortunate term) must be curtailed as extensively and as soon as possible, the airframe people say. Though it has done no particular harm so far—except make production cost more, and dampen the morale of the taxpayers to some extent—it will be increasingly serious from now on. As the flow of materials and component parts approaches and exceeds the capacity of the plane producers, absentee workers will increase cost to the country in terms of airplanes not built.

The Truman Committee, a special group investigating war production, will continue to look into airplane plants from time to time, perhaps for the duration. But its interest in aviation has declined for the present, because the members think they have got the information they were seeking. They say the main difficulty, at least at Willow Run and at Curtiss-Wright, Columbus, Ohio, is scarcity of skilled foremen and group leaders to watch over the efforts of the unskilled multitude, and to serve as a nucleus around which to train more bosses. Technicians say there is no doubt skill is spread too thin, and there is no help for it.

Everybody knows that only a skilled production man can look at a plant and tell whether it is efficient or not. But the Congressmen can observe the difference in morale in plants that are ahead of schedule and those that are behind. But more important, criticised plants are taking advantage of the opportunity to tell the Congressmen their troubles and hope to get something done about them. Some plants have more griefs than others, due to location with reference to transportation, weather, and grade of employables in the region. But they are all faced with the same government red-tape entanglements, the same delays in getting materials and components, and pretty much the same nightmare of design change orders from the Army and Navy. In so far as their problems are the same, the laggers can only try to do better, because their critics judge them by the plants that are out in front of the schedule.

Numerical production of aircraft seems to be no longer a secret. A few days ago Undersecretary of War, Robert Patterson, announced that the output in January was over 5,000, of which 65 percent was combat types, and production in February was about 5,500. At the same time, Patterson said that manufacturers had delivered 27,000 .50 cal. circraft machine guns and 7,200 20 millimeter aircraft cannon. Shortly before the War Department data was released, other responsible officials said that the industry is expected to reach a rate of 12,000 planes per month by December this year. Presumably that would be somewhere near our maximum—if we continued all of our gun, ship and tank programs. At that rate we could produce about 150,000 airplanes in 1944. Some authoritative doubt has been expressed whether we can build the 104,000 expected this year. If we fail, we will come so close that the enemy won't notice the difference. The hardest problem to overcome is design changes, and changes to new models. If the war ends in the first half of next year, making a rough guess, it will have been won substantially with existing models.

Orders for helicopters in substantial numbers have been placed with Sikorsky by the Army—for his model VS-300. Sikorsky had already predicted that several hundred thousand direct lift machines will be sold within ten years after the war to individuals for private use. The Army's order will give impetus to further perfection of the machine (which has been performing satisfactorily for two years) toward mass production and prices within the reach of average citizens. A great may experts now think that rotary wing aircraft will be the volume production air vehicle of the future.

Sky Hook in Action —Because of its many military uses, the two-place helicopter has been developed for the U. S. Army, which has placed orders for a substantial number of these vertical lift machines. The Army's order, giving impetus to the further development of these machines, is expected to encourage extensive civilian post-war use

Messerschmitt 323 is a new six-engined transport plane developed by the Germans to carry 150 troops. It has a multi-wheeled undercarriage for landing on rough ground. But the Army's foreign-plane experts express opinion that production of this plane in numbers is fully two years off. In the Pacific, weakness of the Jap as demonstrated by total destruction of convoy in the Bismarck Sea, indicates that they are trying to engage in an essentially air war with an air force inferior both in number and quality. This department has pointed out before that Japan will have increasing difficulty in bringing out new airplane models due, for one thing, to her extensive dependence on imported machine tools.

To Protect Workers—Small films on the vests of X-Ray workers at the Bloomfield, N.J. plant of Westinghouse Lamp Division, reveals whether the wearer is being exposed to the harmful rays. The film is developed weekly. Henry Schmidt, supervisor of X-Ray testing, is shown

Washington Appointments

WPB, Miscellaneous:

Ralph J. Cordiner becomes a vice chairman and serves as special assistant to Charles E. Wilson, executive vice chairman; J. A. Krug, vice chairman in charge of materials distribution, also appointed chairman of Requirements Committee, and continues as war utilities director; Donald D. Davis, chairman for operations; Carl W. Myers, assistant director of Steel Div. in charge of raw materials and facilities; Robert W. Wolcott, special assistant in Steel Div., handles problems of procurement, allocation, and use of iron and steel scrap; John F. Fennelly, director of Program Bureau; Louis E. Creighton, chief of the Steel Division's Alloy Steel Branch, succeeding William J. Priestley, who has resigned; J. A. R. Moseley, director of Smaller War Plant Corp.

OPA, Regional Office:

James C. Derieux, administrator for Region 4, with headquarters in Atlanta.

NAMES in the NEWS

Col. W. E. Niles has been appointed executive officer of the Tank-Automotive Center at Detroit. Other assignments include four product directors: Henry H. Howard, tanks and combat vehicles; Col. E. S. Van Deusen, transport vehicles; Col. Graeme K. Howard, parts and supplies; C. B. Smith, tools and equipment. Col. Barrett Rogers has been promoted to the position as chief of the Control Branch, and Lieut. Col. George E. Levings becomes chief of the Administration Branch of the Center.

Cyril Chappellet has become vice president of Vega Aircraft Corp., Burbank, Calif. He is also vice president of Lockheed Aircraft Corp. Carl N. Squier has also been named vice president of Vega.

Albert S. Redway

Albert S. Redway has been named vice president of the Geometric Tool Co., New Haven, Conn., and will assist Mr. Sneyd, executive vice president. Mr. Redway was formerly vice president of Farrel-Birmingham Co. and joined that organization in 1925. Since then he has held various positions in the sales, engineering and manufacturing departments of the company. In 1938 Mr. Redway was elected vice president and manager of manufacturing with general charge of production and personnel in the Ansonia and Derby plants, and has also been responsible for planning and coordinating production in the Buffalo plant.

S. B. Taylor, works manager of Reliance Electric & Engineering Co., Cleveland, was elected manufacturing vice president at a recent meeting of the directors of the company. He joined the engineering department and transferred to the manufacturing department in 1930, becoming works manager a year later.

Harry R. Meyer has been named general manager of sales at By-Products Steel Corp., Coatesville, Pa. He began his career with Lukens Steel Co., of which By-Products is a subsidiary, in the Philadelphia sales office in 1919 as a clerk. Shortly afterward he became a salesman, and in 1941 was promoted to the position of assistant manager of combined sales for Lukens and its subsidiaries.

Lester D. Chirgwin has been named general manager of the Buffalo plant of Farrel-Birmingham Co. to succeed Armin G. Kessler who has been promoted to general works manager at the company's main office in Ansonia, Conn.

Thomas P. Archer

Thomas P. Archer has been named a vice president of General Motors Corp. in charge of the manufacturing and real estate staffs. He has been connected with the corporation since 1919 when he became a foreman in the press room of the Ternstedt Mfg. Div. in Detroit. The following year he was made superintendent. Mr. Archer became general manager of that division in 1925. Four years later he joined the Fisher Body Div., becoming vice president in charge of operations in 1934, then in 1941 he was appointed assistant general manager.

Fred W. McIntyre, vice president and general manager of Reed-Prentice Corp., Worcester, Mass., has accepted a position in Washington as the machine tools consultant representative of Lease-Lend in foreign fields.

L. H. Corlette, district sales manager for a.c.f. motors and J. G. Brill Co. at New York City, has been transferred to Philadelphia for the duration of the war to take part in stepping up war production of the company. Mr. Corlette will serve as coordinator of the war production engineering division of the company. R. H. Sjoberg, who was formerly at New York and transferred to Philadelphia a year ago, has recently been made assistant to the president.

Leland M. Hogan has been appointed eastern district manager of American Welding and Mfg. Co., with headquarters in New York, and F. L. Schneider has become Chicago district manager with an office in the Opera Bldg. For

the past 20 years Mr. Hogan has been with the Steel and Tubes Div. of Republic Steel Corp., becoming sales promotion manager in 1930 and sales manager of the New York district six years later. Mr. Schneider began his career with Joseph T. Ryerson and Son in 1915. Later he joined Chicago Steel Service Co. and Edgar T. Ward's Sons Co.

H. H. Erkelenz, who was an executive engineer and coordinator of Harnischfeger Corp., Milwaukee, has been made a vice president in addition to his former capacities. H. O. Menck has also been named a vice president, and retains his former capacity as works manager. Other appointments include F. Salditt elected to the board of directors, W. Heilman as secretary and F. J. Hartman as assistant secretary.

Vice Presidents at Harnischfeger

H. H. Erkelenz

H. O. Menck

E. A. Leaverty has been appointed general purchasing agent for the Metal & Thermit Corp., New York City, including the plants at Jersey City, Carteret and Piscataway, N. J., also at East Chicago and South San Francisco. He will remain at the New York headquarters.

J. E. Love has become district manager of Wiremold Co., located at 802-B Law and Finance Bldg., Pittsburgh. The territory which he covers includes western Pennsylvania, Ohio, West Virginia and Kentucky.

Robert A. Bell, formerly with the Superior Steel Corp., Carnegie, Pa., has become manager of sales for Darwin & Milner, Inc., Cleveland.

William J. Priestley, chief of the Steel Div. Alloy Steel Branch of WPB, has resigned that position to return to his post as vice president of Electro Metallurgical Co.

Fred C. Smith has been named chief metallurgist of Tube Turns of Louisville, Ky. Mr. Smith was formerly employed by Carnegie-Illinois Steel Co. at Chicago for the past seven years in the capacity of field metallurgist, and prior to that he was plant metallurgist for International Harvester Co.

Floyd J. Lucas, recently connected with the Machinery Branch of the Office of Price Administration in Washington, has joined the sales staff of Interstate Machinery Co., Chicago.

I. L. Jennings, vice president of Lamson & Sessions Co., Cleveland, has retired from active business for reasons of health but will remain as director. He has been with the firm since 1907 and worked through various departments for several years, advancing to vice president in 1941.

Fred Greve has been advanced to the position of vice president of Cleveland Pneumatic Tool Co. in charge of purchases.

Timothy E. Colvin, vice president of Aircraft Accessories Corp., has been appointed executive vice president in charge of the division at Burbank, Calif.

Henry S. Deichert has become factory manager for the Eastern Div. of Vultee Aircraft Corp. at Allentown, Pa. He was formerly connected with Consolidated Aircraft Corp. at Fort Worth.

Ray A. Penney, assistant chief engineer of St. Paul Hydraulic Hoist Co., Minneapolis, has been advanced to chief engineer of the company.

Ben L. Metzger has resigned his position as technical supervisor in the ordnance department at Willys-Overland Co., Toledo, to become operating manager of Allied Screw Machine Co., Chicago. Previously Mr. Metzger was connected with Bendix Aviation Corp. and Auto-Lite Co.

Executives at Cramp Shipbuilding

Henry E. Rossell

Garland Fulton

Henry E. Rossell has been appointed president and general manager of the Cramp Shipbuilding Co., Philadelphia, and Garland Fulton has been named a vice president. Mr. Rossell has served on the faculty of M.I.T., and since Cramp reopened in 1940 he has been retained in an advisory capacity on the rehabilitation and equipping of the yard, also making special studies of welding sequences in the construction of cruisers. Mr. Fulton has been connected with the Construction Corps of the Navy at the New York Navy Yard, and has held various engineering assignments in Washington.

F. F. Franklin, who was formerly associated with Republic Steel Corp. at Canton, O., and recently with Armour Research Foundation in Chicago, has been named chief metallurgist at Ingersoll Steel & Disc Co., Chicago.

R. C. Garvey has been made district sales manager at San Francisco for Jones & Laughlin Steel Corp. to succeed C. P. Hensley, who recently retired. E. S. Holden becomes resident manager at Denver.

They Shall Have Music — Employees double as musicians and furnish lunch-time entertainment at the plant of the Bullard Company. Programs include orchestral music, vocal solos and group singing. Foremen report the relaxation steps up production during the afternoon

OBITUARIES

Stanton Hertz

Stanton Hertz, vice president and assistant to the president of Copperweld Steel Co., Glassport, Pa., lost his life in a fire in his home in Pittsburgh. In 1921 Mr. Hertz joined Copperweld and served successively as chief engineer at the New York office, general manager of sales, and vice president. For five years beginning in 1936 he was executive director of the Copper Wire Engineering Association, and returned to Copperweld Steel Co. in 1941.

Peter Patterson

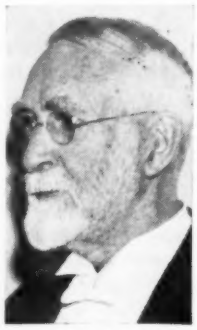
Peter Patterson, retired vice president of National Tube Co., Pittsburgh, in charge of engineering and operations, died at the age of 73. He entered the employ of the company in 1886, and later became foreman and superintendent of the Lapweld mill. In 1900 Mr. Patterson was appointed chief engineer, and in 1902 was made assistant vice president in charge of operations. He was named vice president in 1926 and served in that capacity until his retirement in 1936. About 42 years ago Mr. Patterson developed the standard Lapweld furnace, an application of individual motors to drive rolls and other mill machinery.

William Jordan, 74, died recently. Mr. Jordan was an inventor of metal tubing machines, and organized and headed the Jordan Welding & Mfg. Co., of Cleveland.

Joseph H. Harnischfeger, 64, a director of the Harnischfeger Corp., Milwaukee, passed away. He had been associated with the company since he was 17, and has served on the board of directors since 1912.

George F. Downs, former president of Lackawanna Steel Co., passed away at his home in Florida at the age of 70. He joined the company in 1905 as assistant plant superintendent, and was elected president in 1920. Mr. Downs resigned the presidency and retired from business in 1922 after the merger of the company with Bethlehem Steel Corp.

Frank A. Ball, retired president and chairman of the board of L. S. Starrett Co., Athol, Mass., died in Florida at the age of 84. Mr. Ball had been connected with the Starrett firm for 45 years, and was president from 1922 to 1940, when he became chairman of the board.



Charles T. Main

Charles T. Main, 87, widely known consulting engineer, died in Winchester, Mass. He entered private practice as a designer of industrial plants in 1893 after serving as a draftsman for the Manchester Mills and superintendent and engineer of the Pacific Mills. Mr. Main was a past president of the American Society of Mechanical Engineers, and in 1935 received the society's annual award for "distinguished achievements and for eminent services to the engineering profession." Mr. Main established the Charles T. Main award for student members of the A.S.M.E. He was also a member of several other engineering societies.

Arthur C. Flory, 60, died after a long illness. He had been manager of the steam turbine department of Allis-Chalmers Mfg. Co., Milwaukee, for 24 years.

William J. Kibler, 70, veteran of nearly a half-century of service with Buffalo Steel Co., Tonawanda, N. Y., died in that city recently. He was elected president of the company in 1936.

Axel Nelson, president of Aurora Steel Products Co., Aurora, Ill., died at the age of 70. Mr. Nelson founded the company in 1915.

C. G. Gilbert, 60, manager of the Detroit office of Federal Products Corp., died following a heart attack. He began as general representative with the corporation 22 years ago, and was made manager of this Midwest office in 1926.

Martin Schiff

Martin Schiff, 53, chief engineer of Century Electric Co., St. Louis, died suddenly at his home. Before joining the Century organization in 1933 he had previously been employed as a test engineer at Diehl Mfg. Co. in Elizabeth, N. J., from 1912 to 1913. Until 1916 he was assistant engineer of the Ideal Electric & Mfg. Co., Mansfield, Ohio, and after serving as a lieutenant in the U. S. Navy for three years Mr. Schiff was connected with Roth Bros. & Co. as chief engineer for nine years. He was assistant chief engineer and assistant to the president of Imperial Electric Co., Akron, from 1929 until joining the Century Electric Co.

Walter T. Mahla, 52, general superintendent of the Christy Park works of National Tube Co. in McKeesport, Pa., died suddenly. He had held the position of superintendent for nearly three years, and was a veteran of 37 years in the steel industry.

William E. Bee, 72, founder of Palmer-Bee Co., Detroit, died in that city. He joined Detroit Steel Spring Co. at the age of 12 and later became superintendent of the plant. Following that he became connected with Gates Iron Works, Sheffield Car Wks., Webster Mfg. Co., was one of the organizers of Stephens-Adamson Mfg. Co., and then engineer for Pittsburgh Shafting Co.

BUSINESS ITEMS

Whiting Corp., Ltd., has moved to 45 Richmond St., W., Toronto, where H. M. Rowlette, recently elected vice president and general manager, will be in active charge of the Canadian business.

Industrial Sheet Metal Works, Detroit, has announced a change in its name to Industrial Equipment Corp., and continues to operate under the same management.

Hardman Aircraft Products, Inc., of South Gate, Calif., has announced that its purchasing offices are located in Bldg. 6 at 5843 Fernwood Ave., Hollywood, Calif.

Acro Electric Co. is now occupying a new plant at 1305 Superior Ave., Cleveland, with greatly enlarged manufacturing facilities.

Thomas Truck & Caster Co., Keokuk, Ia., has purchased the property and business of the Buffalo Pulley & Caster Co. of Buffalo, and the name is being changed to Buffalo Caster & Wheel Corp. and will operate as a subsidiary. James R. Coole, formerly district representative of Thomas Truck, is vice president of this company.

MEETINGS

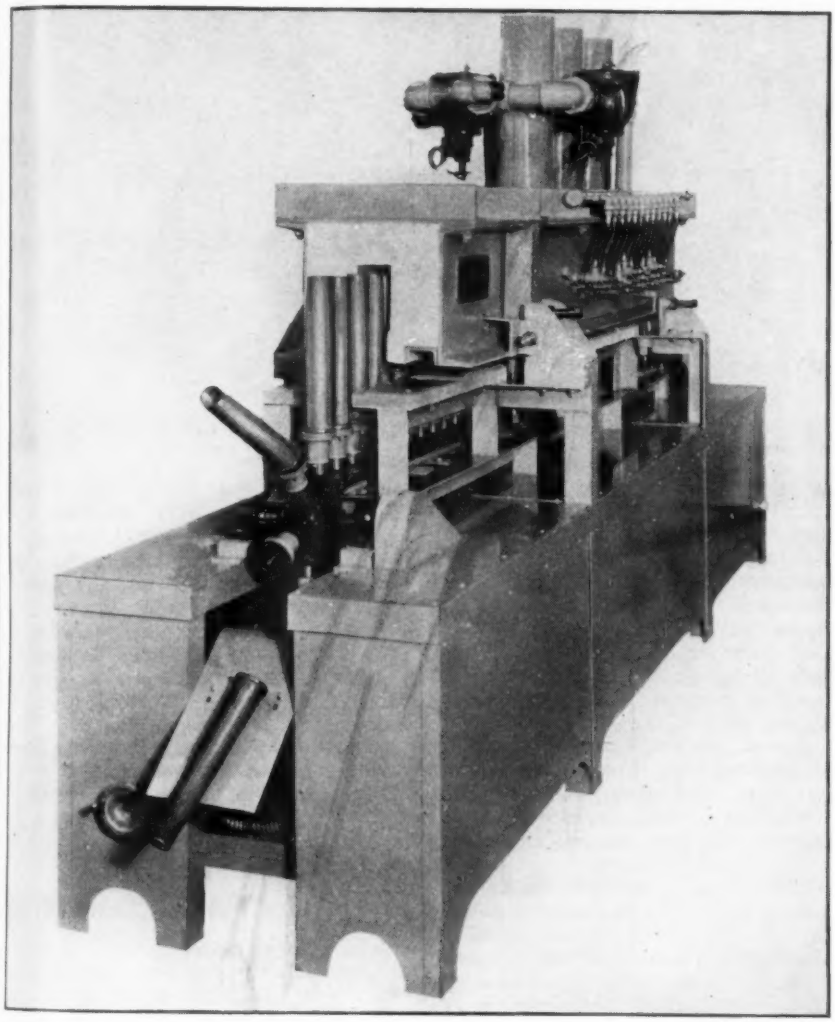
American Society of Tool Engineers. Annual meeting. Milwaukee Auditorium, Milwaukee, Wis. Mar. 25-27.

National Metal Trades Assn. Production Conference. Palmer House, Chicago, Ill. May 26-27.

American Iron and Steel Institute. Annual meeting. Waldorf-Astoria Hotel, New York, N. Y. May 27.

SHOP EQUIPMENT NEWS

Selas Produces Automatic Heat-Treating Machine Which Anneals Mouth Ends of Steel Cartridge Cases



For the continuous annealing of the mouth ends of steel cartridge cases in sizes from 37 to 105 mm., the Selas Company, Erie Ave. and D St., Philadelphia, Pa., has built a series of automatic heat-treating machines utilizing ceramic-cup radiant gas burners in refractory lined tunnels which let down over moving lines of cartridge cases. Each cartridge case rotates about fifteen times on an individual spindle during its transit through the annealing tunnel so that uniform preheating, heating and cooling are achieved over the desired area. The tunnel is lowered sufficiently to anneal the metal down to a point several inches below the mouth opening.

Because combustion is confined within the ceramic concavity of each burner, the flame does not directly impinge upon the cartridge cases, and it is said that discoloration is thereby reduced to a minimum. Scaling is prevented because the work is surrounded by combustion products rather than air in all hot zones.

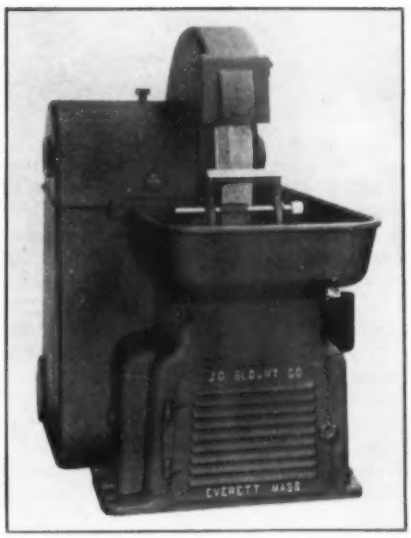
The 24 burners are staggered, 12 being placed in a zig-zag pattern on each side of the tunnel. Each burner has a built-in needle-valve input adjustment, Thus, heat inputs at various points may be independently adjusted and balanced to suit the heat distribution pattern desired on the work. The primer cup end of each cartridge case remains cool at all times because of the speed and localization of heating over the portion annealed, the corrugated asbestos heat baffle immediately below the tunnel, and the contact of the primer cup with the cold metal mass of the spindle upon which it rests.

The annealing tunnel is quickly removable by lifting. It is supported on jackscrews and positioned by longitudinal and transverse adjusting screws which allow for expansion, and is lined with 4½ in. of insulating refractory. The conveyor mechanism is adjustable for speed, driven by a ½ hp. motor, utilizes self-aligning ball bearings and pillow blocks with take-up adjustment, and is hand loaded. This machine requires a floor space of 2½×11 ft., with loading at a level 36 in. above the floor.

Blount Announces Model H 30-In. Wet Tool Grinder

The Blount Model H 30-in. wet tool grinder developed by J. G. Blount Co., Everett, Mass., is built for grinding all hard metals, special alloys, and tungsten carbide. The wheel guard is of semi-steel with removable cover inclosing the grinding wheel, and carries an adjustable nosepiece. A 5 hp. electric motor is mounted on an adjustable hinged bracket just inside the special ventilated base. Grinding wheel speed is 720 r.p.m. Speed in wheel change is made possible by removing the cover on the wheel side, unscrewing a single nut, and removing the loose flange.

A four V-belt pulley is used on the motor, while the wheel spindle carries a three V-belt pulley. The fourth V-belt from the motor pulley drives the water pump which is located inside the rear ventilated base. A filter tank with removable strainer filters the

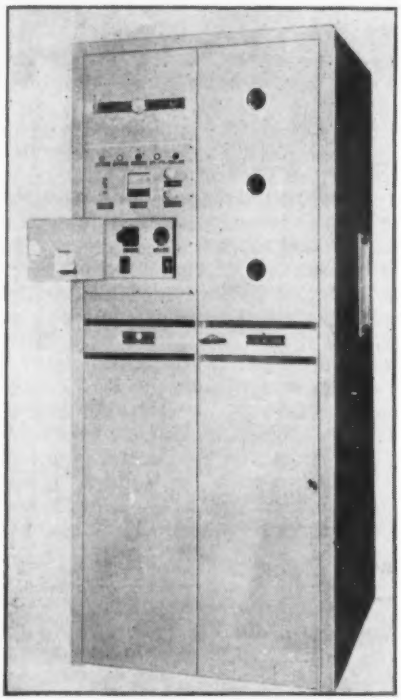


coolant before passing through the pump.

This grinder measures 38 in. high from the floor to the center of the spindle and 35 in. from the floor to the top edge of the pan. The height from the bottom of the pan to the center of the grinding wheel is 11¾ in. Pan measurements are 52×26 in. and 8 in. deep. The grinder weighs 2,450 lb. with motor.

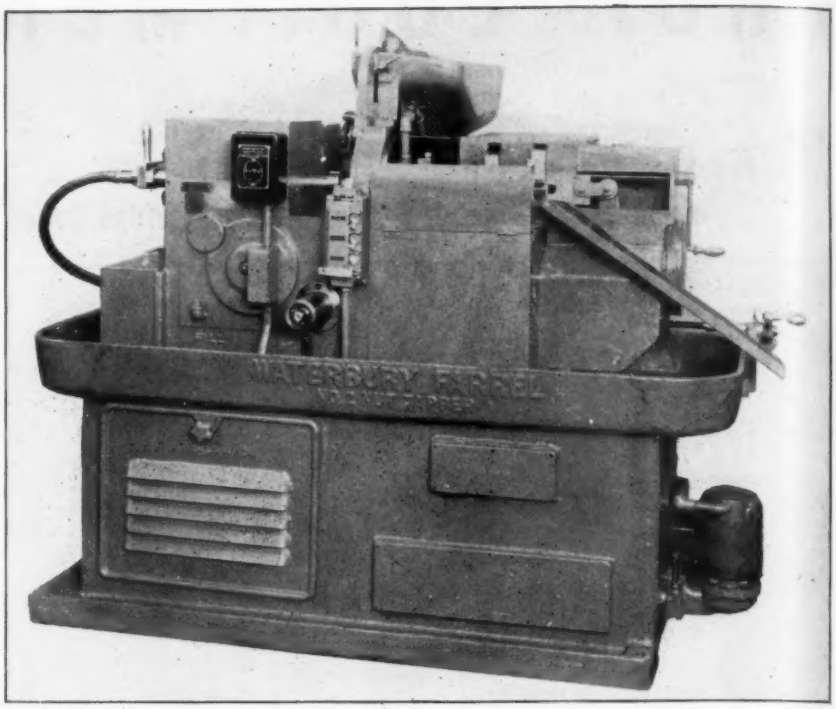
G. E. Electronic Control Suited for Aluminum Welding

For the resistance welding of aluminum, the General Electric Co., Schenectady, N. Y., has introduced an electronic control of simplified construction. This control provides the high current and short welding time required for resistance welding of this metal. The equipment consists of a charging circuit, a discharge circuit, control station, Pyranol capacitors, and sequence control mounted in one cabinet. The industrial control inclosure has full length front doors and removable rear covers. It is ventilated by filtered air drawn in by a blower which creates positive pressure within the cabinet and consequently minimizes the infiltration of dust and dirt. The tube circuits are mounted on a single, hinged compound base that can be swung out readily for servicing.



Another feature is that the control station can be removed from the cabinet and attached to the welding machine. With this arrangement the control cabinet can be located at a remote point. The small wiring between the various panels and the control station is brought to a centralized terminal board, making rapid and easy checking of the circuit possible.

Waterbury Farrel Improved Nut Tapping Machine Provides a Selector Mechanism for Special Work



Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., has improved and redesigned its line of straight tap nut-tapping machines. A selector mechanism is provided which will handle special work such as slotted and castle nuts, delivering them to the stationary straight-shank tap so that they all face the same way. The hopper disk is rotated intermittently by a duplex ratchet pawl, which is said to assure adequate and correct feeding for all types of work. The feed chutes and chute-ends are clamped in place and, furthermore, each chute assembly is complete for each size nut and no adjustments are required.

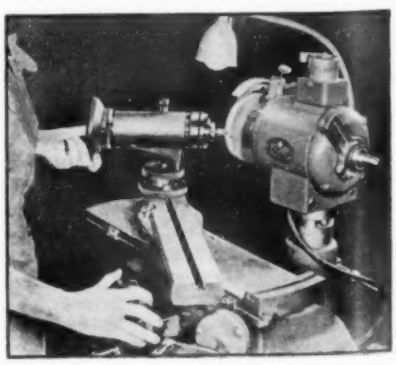
The pusher mechanism which advances each nut into the work-holding jaws is arranged so that it can be instantly withdrawn from the chute end when it becomes necessary to clear any obstructions. This mechanism is adjustable to accommodate nuts of various thicknesses, and the pusher-tip has a ball bearing which allows it to rotate with the nut without marring it. Automatic safety throw-outs stop the machine automatically in case obstructions or imperfect blanks interfere with the normal operation.

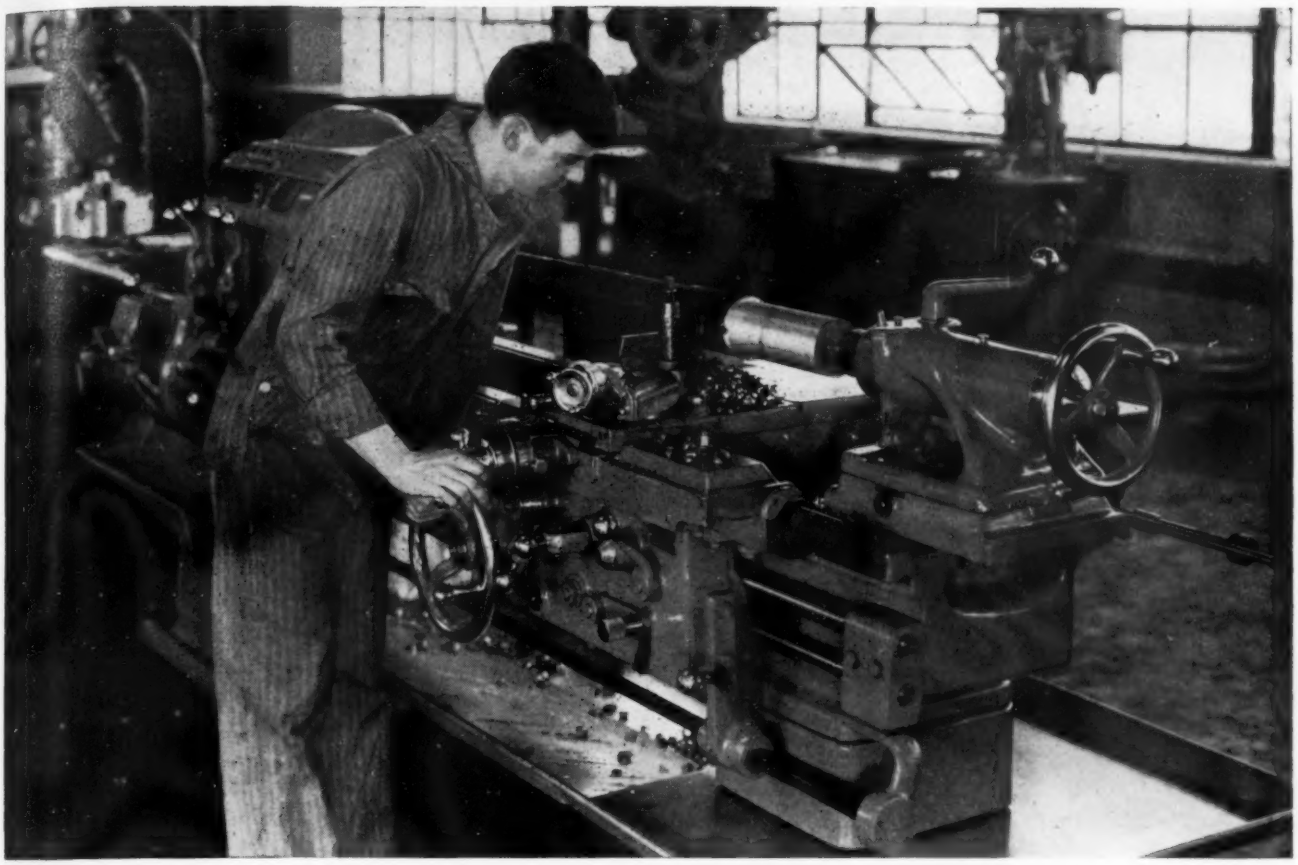
The tap is held in place by two pairs of clamping arms which open and close alternately, thus the tap is held securely at all times by one or the other pair of clamps. The tapped nuts are intermittently pushed along the tap shank by a pair of vertical spring fingers and two horizontally actuated claws, assembled in a reciprocating slide. The spring fingers push the nuts along the tap shank until a few of them are located between the first of two pair of stationary guide fingers. They are then advanced by the claws. These claws are synchronized to operate with the opening and closing of the clamps. While the first claw is advancing the nut to a position between the second pair of stationary guide fingers, the second claw remains inoperative until the clamps have alternated their position, thus allowing the second claw to engage the nut preparatory to completing the stripping action.

The nut tapping machine is available in three standard sizes, with a range from ¼ to ⅞ in. tap diameter capacity.

I-G-C Relief Grinder Fixture Takes Pilot and Center Drills

Countersinks of all types, integral pilot cutters and pilot drills, either right or left handed, and center drills can be handled with the I-G-C relief grinder introduced by Industrial Grinding Co., Los Angeles, Calif. The fixture fits any standard grinder, and can be quickly adjusted for correct relief and





EXPERTS *not required!*

You can train inexperienced men or women in a comparatively short time to obtain quantity and quality production on Monarch lathes without undue fatigue. This is because Monarch engineers have always considered *simplicity of operation* to be a basic factor of design.

Such characteristics as simplified control of speeds and feeds and thread chasing . . . ease of mounting plates, chucks or fixtures on spindle . . . automatic lubrication of all major units . . . large diameter, direct reading micrometer dials and other features remove the strain of learning, shorten training periods and result in more rapid progress toward quality production.

With this background, operators can take quick advantage of Monarch production lathes, toolmakers' lathes, Monarch-Keller automatic forming turning machines and Monarch automatic sizing lathes, all of which are doing important war work in plants throughout the world.

With the pressure on all of us to produce "faster for fighters", we suggest that you review the versatility of Monarch lathes and the wide variety of work which they can do in your plant as they are doing so successfully in other plants. If our engineers can help you, they are at your service.

THE MONARCH MACHINE TOOL COMPANY · · · SIDNEY · OHIO

MONARCH LATHES

COVER THE TURNING FIELD

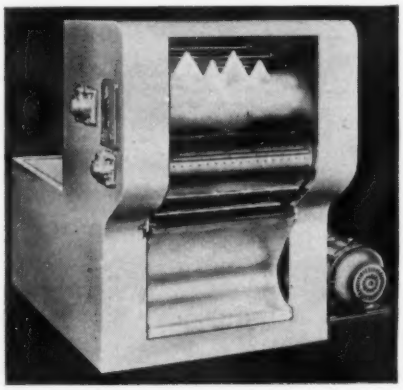
angle in relation to the grinding wheel. It fits any standard grinder and handles work from $\frac{1}{16}$ to 1 in. diameter. The lift of the single cam is variable from 0.001 to $\frac{1}{8}$ in., and adjustment pins are provided for 1, 2, 3, 4, 6 and 12 fluted cutter grinding.

The main housing of the grinder is of cast iron which supports a hardened and ground spindle on two large bearing surfaces. The cam is hardened tool steel with steel adjustment pins. The fixture swings 90 deg. to the right or left, and the base is calibrated in 5 deg. increments.

Tumbl-Spray Washing Machine Built for Handling Small Parts

Announcement has been made by American Foundry & Equipment Co., Mishawauka, Ind., of the Tumbl-Spray washing machine, a small parts washer designed around a special endless tumbling belt. This batch-type machine receives and discharges the parts to be cleaned through a large front opening. The open-type barrel gives complete access to the parts while in process, and the spray system can be easily reached for cleaning and inspecting the pipe and nozzles.

Where the parts are handled in batch form, they can be washed only. Another layout provides a power wash and power rinse followed with a compressed air blow-off to remove excess liquid. A special arrangement keeps the two solutions separate and permits washing and rinsing in one compartment without the transfer of the part. The mill is run in reverse to unload the machine which discharges all parts over a chute. This Tumbl-Spray unit is available for heating with gas, electricity, or steam and can be supplied with full automatic controls.



Syntron Vibra-Flow Conveyor Feeds Metal Parts to Furnace

For feeding metal parts to continuous heat-treating furnaces, the Syntron Co., Homer City, Pa., has introduced the Vibra-Flow feeder conveyor with rheostat control. The heat-resistant feeder consists of a wide flat pan of the required size with a stainless steel nose piece, vibrated by a pulsating magnet which causes the pieces to flow forward at the desired speed. A rheostat in the separate electric control panel regulates the speed of the flow. An electric clock timer in the controller can be furnished to provide an adjustable intermittent feed. This feeder does not have any moving parts.

Fellows Introduces Cone-Point, Circular Pitch Gear Testers

Two fixtures for bench use to check gears have been introduced by Fellows Gear Shaper Co., Springfield, Vt. One of these is known as a cone-pointed testing fixture, which tests concentricity of the pitch circle, while the other fixture checks the circular pitch or tooth to tooth spacing. Both fixtures have a maximum capacity for gears up to 12 in. pitch diameter, maximum distance between centers being 15 in.

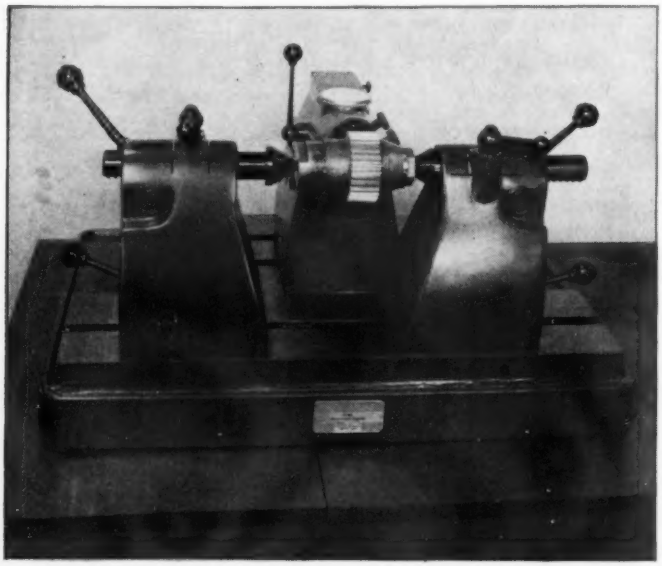
Three adjustable brackets are mounted on the base of each of these fixtures. Two of the brackets carry the work-holding centers. The other bracket, located at right angles to the brackets carrying the centers, retains the measuring pointers, fingers and dial indicator, as well as the indexing mechanism.

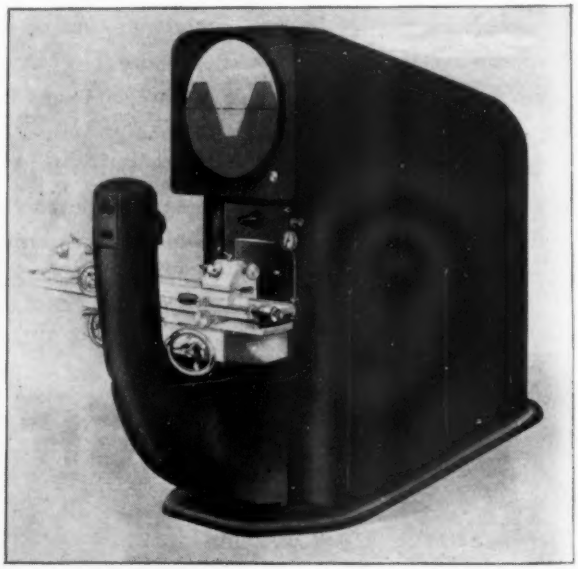
The spindles which carry the centers are adjusted through a rack and pinion, and are clamped by levers. The spindle on the circular pitch testing fixture, carrying locating and measuring fingers, is provided with a graduated collar at the rear end for setting the fingers normal to the helix if desired when checking helical gears. The brackets carrying the measuring pointers can be located in two positions. These measuring brackets for cone-point and circular-pitch testing are interchangeable on the same base. A work indexing device is connected to the lever operating the pointer holder, which automatically indexes the work on the return stroke. The indexing fingers are adjustable for different pitches and numbers of teeth.

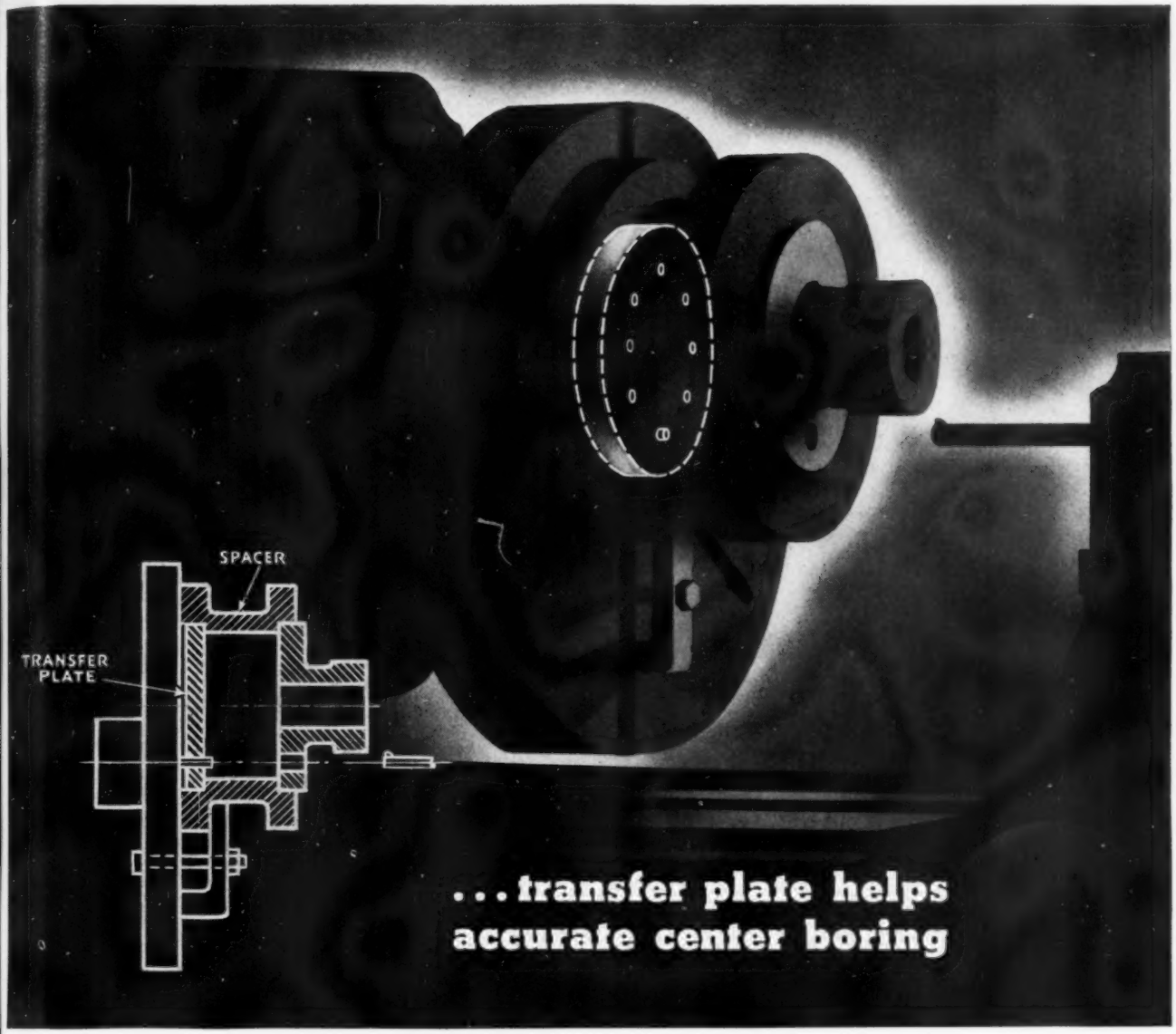
Portman Optical Comparator Handles Large Sized Parts

The Model P-3 universal optical comparator, manufactured by Portman Machine Tool Co., 17 and 19 Beechwood Ave., Mt. Vernon, N. Y., is designed to project large images for parts inspection. Lens units are available to provide magnification for 10X, 25X, 31¼X, 50X, 62½X, and 100X.

This comparator offers flexibility of movement in all directions. The gage travel measurement control devices permit readings to 0.0001 in. over the entire range. A graduated protractor screen is included as standard equipment. The distance between centers is 12½ in., vertical measuring range 8 in., horizontal measuring range 8 in. The work screen diameter is 18 in., and







Information supplied by an Industrial Publication

The problem of drilling a number of holes in a part on precise center distances is seldom simple. It is particularly complicated in mass production of parts where holes must register accurately.

The answer in one plant is what is known as a transfer plate. This is really a circular template, of any thickness over ⅛ inch, with uniform holes drilled on accurate centers. These holes fit a pin located at the exact center of a lathe face plate.

In mounting, the work is assembled to the transfer plate with a spacer between. The assembly is pinned to the face plate through one of the holes in the transfer plate, and clamped tight.

A boring bar in the lathe tool rest can be used to bore a hole of any desired size in the work. The hole will be exactly in line with the pin, and consequently with the hole in the transfer plate.

Subsequent holes are bored by passing the pin through the remaining holes in the plate, until all are bored. When finished, every hole, regardless of diameter should be on the same center as the corresponding hole in the plate.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.
MOLYBDIC OXIDE BRIQUETTES • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Mo-lyb-den-um Company
500 Fifth Avenue • New York City

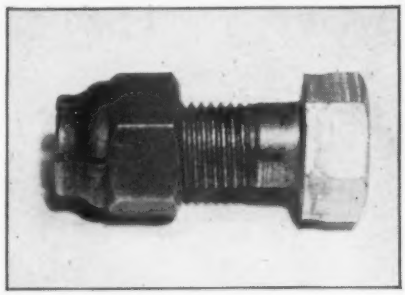
MOLY

vernier reading on this screen is 360 deg. Work table dimensions are 6×24 in. The comparator is 72 in. high, 34 in. wide, 72 in. deep, and weighs 1,500 lb.

Chandler Self-Locking Nut Locks Onto Bolt at Any Point

A self-locking nut has been made available by Edward F. Chandler, 535 Fifth Ave., New York, N. Y., which has been especially made so that as the rotation of the nut is continued the advancing bolt selectively engages the threads in jaw-like elements and urges these threads back into true phase relationship with the threads of the lower section. By this means a strong axial gripping action is established between the threads of both nut and bolt.

A channel has been cut in the bore about midway between the top and bottom of the nut. When the nut is threaded this channel, which is slightly



deeper than the outside diameter of the thread, serves to divide the thread into two sections. The upper section is slotted to provide a plurality of uniformly spaced, threaded jaw-like elements. While the bore remains substantially uniform as does also the pitch of the thread, the two thread sections are set together sufficiently to absorb the normal axial play between the threads of the nut and bolt. The nut locks onto the bolt at any point.

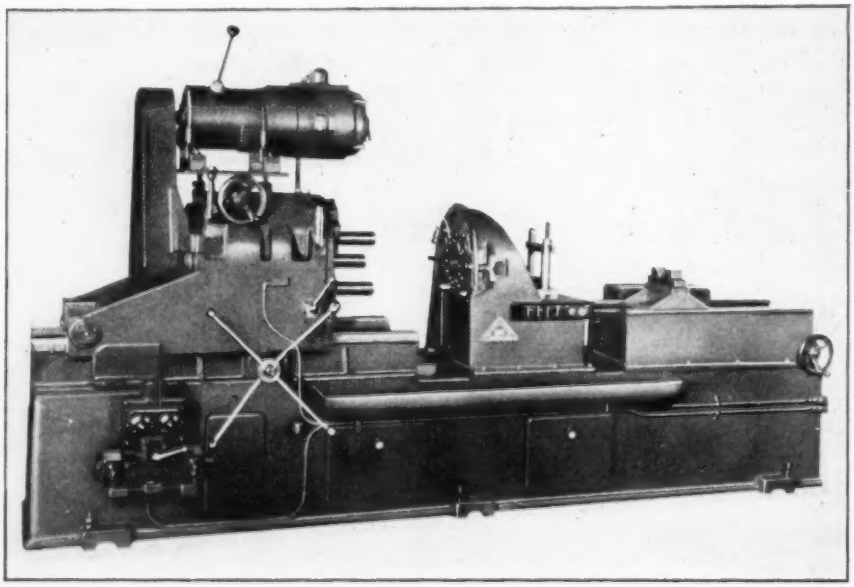
LeMaire Machine Drills, Reams and Taps Holes In Flanges of Crankshafts With One Setting

A machine for drilling, reaming and tapping holes in flanges of crankshafts with one setting has been announced by LeMaire Tool & Mfg. Co., Dearborn, Mich. Set-ups can be made to accommodate different models of crankshafts. It is said that this machine is a compromise between a single spindle set-up and one having fixed spindle drill heads.

For drilling and reaming, the movement of the spindle head is controlled by hydraulic circuit, which allows rapid advance, coarse feed, fine feed, and rapid return. Three horizontal spindles, spaced 120 deg. apart around a circle, can be spaced on any bolt circle diameter from 5½ to 10 in. It is possible to drill flanges having 3, 6, or 12 holes by indexing the head in which these spindles are mounted.

For tapping, the hydraulic cylinder is disconnected and the taps are fed into the work by manual operation of the star handles. When the slide has moved the required distance, the taps are reversed by limit switch. Four-speed transmission is provided for drilling and tapping.

The spindles are driven through a cluster box with connections to gears made by universal joints. The spindle drive is carried in a drum which is rotated by a worm and worm wheel and provided with an index plate locked by a shot bolt. To accommodate the various models of crankshafts, the right-hand end of the machine is equipped with a fixture having removable adaptors, V-blocks and drill plates.

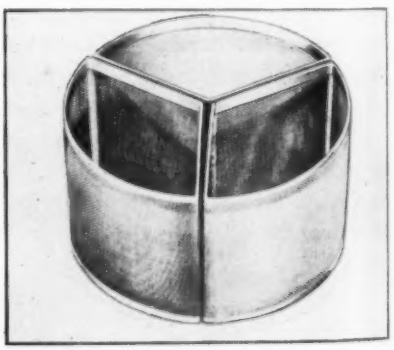


WYCO Flexible-Shaft Machine Has Radial Type Construction

A line of WYCO radial type flexible shaft machines has been announced by Wyzenbeek & Staff, Inc., 838-842 West Hubbard St., Chicago, Ill. This type machine is recommended wherever suspension type machines are difficult to hang and where floor or bench machines are difficult to hang and where floor or bench machines are in the way of the operator. The advantage of the radial type model is that it can

be put up out of the way to avoid dirt and abrasive dust conditions.

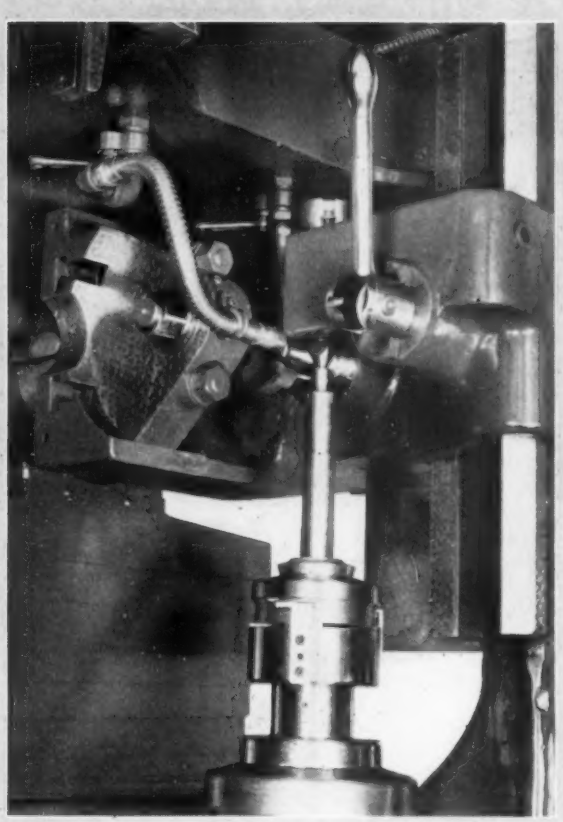
The radial type construction is available for all of the company's multiple speed machines, for the toolroom models from ¼ to ½ hp. and for heavy-duty models of ½ to 2 hp.

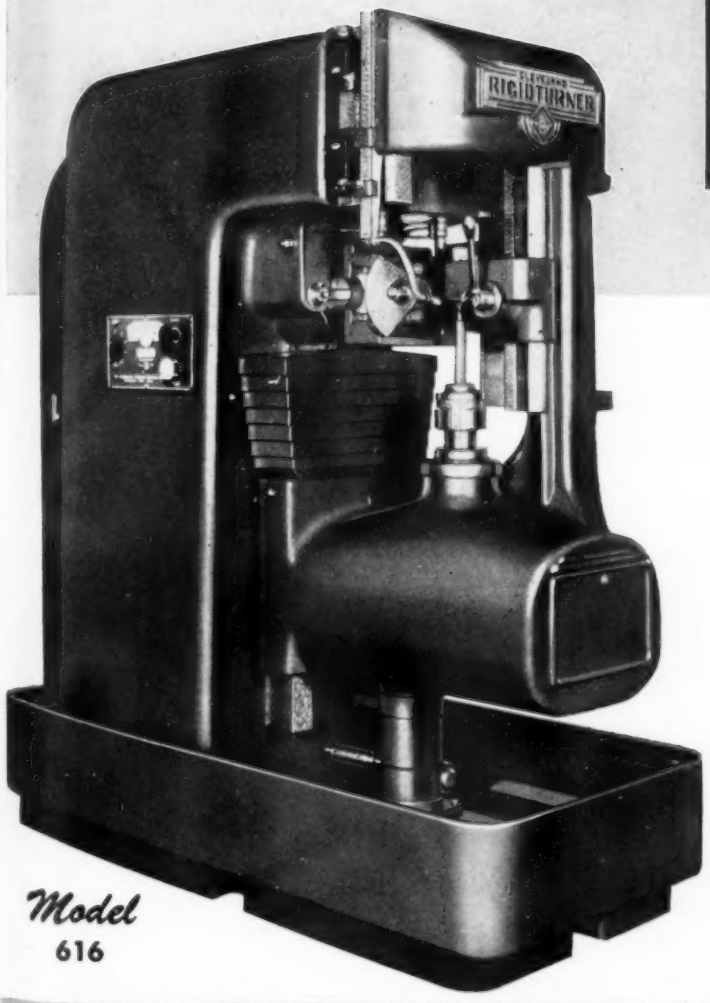


L & R Develops Triple Basket To Fit Its Cleaning Machine

A triple basket has been developed by L & R Manufacturing Co., 54 Clinton St., Newark, N. J., to fit into the 3⅜ in. deep by 5½ in. diameter work basket of its industrial cleaning machine. Different types of parts can be placed in this basket at one time, and the fine mesh holds minute parts without danger of slipping through the mesh and becoming mixed with other elements.

The RIGIDTURNER is easy to operate





Model 616

• In addition to the design by which a cut is completed at one complete cycle of the cutter the simplicity of loading and unloading the machine is responsible for unusually high production and accuracy.

The work is mounted on the spindle and held in position by the tailstock which may be raised or lowered to accommodate work and locked in position by a single lever.

Removing cutter is also very simple—merely remove outboard bearing housing and slide cutter off the arbor. Any of these operations can easily be done by ordinary labor.

The Rigidturner is adaptable to any type shaft turning—provides accurate duplication on mass production—and ease and speed of change over makes it profitable on small lots.

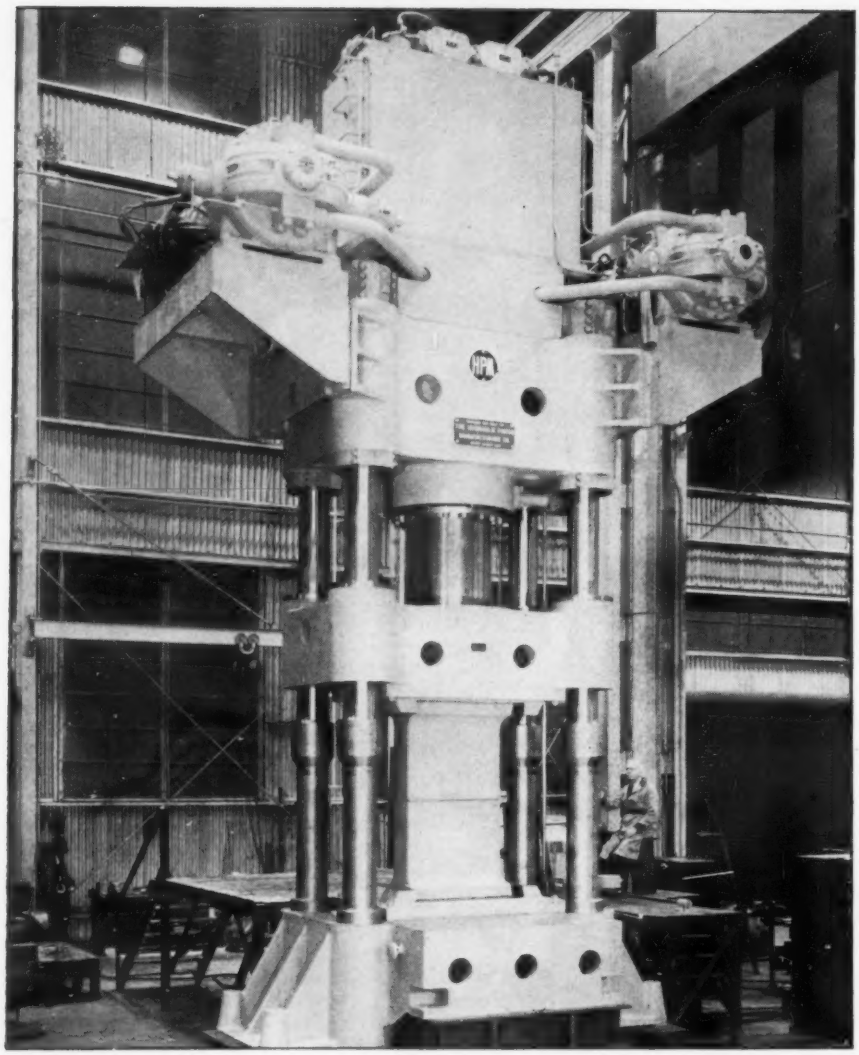
Also furnished in 8 spindle Rotary Model for peak production of multiple diameter work to close tolerances.

Consult a CH Engineer on your work requiring multiple diameter turning. Full descriptive bulletin upon request.

The CLEVELAND HOBBING Cleveland ... MACHINE Company ... Ohio

BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS

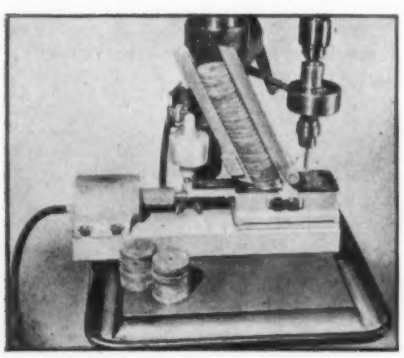
HPM Produces 1,000 Ton Open Forging Press



Hydraulic Press Mfg. Co., Mount Gilead, Ohio, has announced a 1,000-ton Fastraverse, self-contained, open forging press with motor driven hydraulic pumps mounted directly to the press cylinder. This machine uses the Fastraverse principle of press operation, which provides for prefilling and exhaust of the main cylinder during rapid traverse ram movement. The press closes and opens at a rate of 560 in. per min., with speed metered by a radial hydraulic pump. Pressing speed of the machine is 105 in. per min.

Ram travel of the press is reversed without the use of an operating valve. Instead, the delivery of the pump is reversed. Both the length and speed of the ram travel are adjustable. Pressure is built up automatically.

Measurements of the bed are 72×111 in., and those of the platen are 72×48 in. The maximum daylight opening from the platen to the bed is 108 in. and 30 in. between die blocks. The machine weighs 244,500 lb.



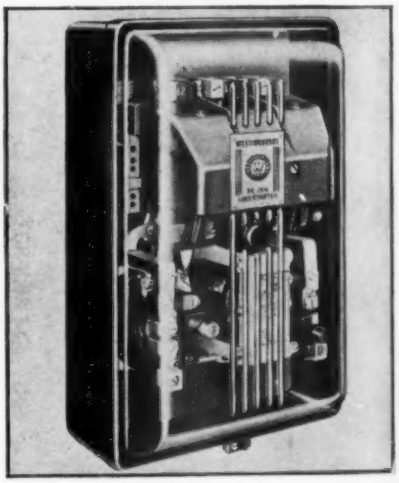
Mead Disc-Feeder Fixture Handles Various Shaped Work

A semi-automatic fixture for feeding and holding work while drilling and tapping operations are performed has been announced by Mead Specialties Co., 15 S. Market St., Chicago, Ill. It is known as the Disc-Feeder, and will feed, hold and eject work pieces at the rate of 3,000 to 5,000 per hr., depending upon the size of the work. Flat stock of a variety of shapes such as rectangles, ovals and squares can also be handled in this fixture. One or more drill bushings can be mounted above the work where desired. The Disc-Feeder can be quickly adjusted to accommodate work varying from approximately 1 to 3 in. in diameter and with thickness ranging from ⅛ to approximately ¾ in.

Small cylindrical work can be handled by means of special attachment. By removing the hopper the Disc-Feeder can be equipped with ordinary flat jaws for use as an air-operated hand feed drill vise. The ram and anvil are provided with V-notches to center the work and are serrated to hold the work securely. This fixture is operated by a foot control valve which changes the work when the pedal is pressed, and holds it in position for machining until the pedal is pressed again.

Westinghouse Linestarter Meets Small Space Needs

A Size 2 linestarter, which requires less than half the mounting space of former units has been brought out by Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. This compact line starter has been designed for group mounting, built-in applications or remote mountings, and has a clapper-



type armature with knife-edge bearings. Double-break silver-to-silver contacts are utilized. Overload relays are reset by hand or automatically. Provision is made for a total of four normally open or closed interlocks, on applications requiring sequence or auxiliary interlocking. All parts of the unit are accessible from the front, and control circuit terminals and interlock terminals are clearly marked for easy installation and repair.

Lowe Makes Adjustable Arm and Portable Inspection Devices

For inspection of tools, parts or objects difficult to see with the naked eye, S. Lowe & Sons Co., 20 Sanford St., Fairfield, Conn., has made available a port-

THERE IS ONLY SO MUCH TOOL STEEL AVAILABLE!

Every time a tool is broken, that tool must be replaced if production is to continue. Today, it takes as much as six months to obtain tool replacements.

One of a series of 2⅓ by 3½ ft. 3-color bi-monthly posters, designed to help reduce tool breakage through worker education, made available to users of **"TOMAHAWK"** tools, without charge.

For complete information wire or write

GENESEE TOOL COMPANY
FENTON, MICHIGAN

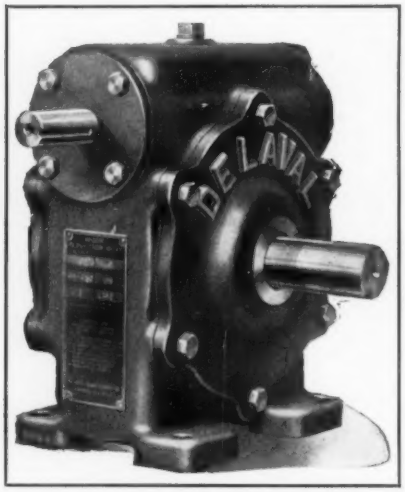
able Inspecto-Graph. It is adjustable, enabling the user to tilt the lens to any desired position.

The Inspecto-Scope, for continuous production inspection, has an adjustable arm. Large quantities of parts can be rapidly examined by being passed under the Inspecto-Scope. It may be used on conveyor belts, gear cutters, lathes, or any precision grinding or machining equipment.

It is equipped with two fluorescent tubes which concentrate a diffused light directly upon the work being inspected. A 4-in. lens doubles the size of the work, and provides undistorted magnification to both eyes. These devices are plugged into any 110 volts a.c. outlet.

De Laval Makes Small Worm Gears With Casings Cast in One Piece

De Laval Steam Turbine Co., Trenton, N. J., is manufacturing a line of small worm gears with casings cast in one piece. The gears have ratios of 3⅝ to 1 up to 60 to 1 and in 3 in. and 3½ in. center distances. The interior is ac-



cessible by removing one of the side plates. A gage cock is provided for checking the oil level. The worm and worm shaft are of carburized nickel steel, while the worm wheel consists of chill-cast bronze with hobbed teeth. These units are supplied for either top or bottom drive with shaft extension to right or left, or in both directions. The lower ratios can be used as speed increasing gears up to a maximum of 2,000 r.p.m.

Metallizing Engineering Introduces Fuse-Bond Process Which Electrically Prepares Parts for Metallizing

Machine components and similar metal parts may now be prepared for metallizing electrically by the Fuse-Bond process announced by Metallizing Engineering Co., Inc., 21-07 41st Ave., Long Island City, N. Y. With this process electrical resistance heating of a special electrode metal, as applied to the base, causes these metals to be simultaneously exploded into a foam and fused to the base metal. The structure of this metal foam is comparable to that of frozen soap suds, with many irregularly shaped cavities over its surface. Because of the unique method of depositing the electrode metal, the over-all contour is also quite irregular. The height of these surface irregularities can be controlled ranging approximately from 0.004 to 0.030 in. The final

This Fuse-Bond equipment is compact and occupies small space

result is an extremely rough and porous surface for the base metal, which is a good bond for subsequent coatings of sprayed metal which can be obtained on practically any kind of metal surface not suitable to prepare by other methods.

The equipment used in preparing the components for metallizing is a Type C Fuse-Bond unit which is small and compact and arranged for connection to either 110 or 220 volts, 60 cycle, a.c. circuits. The equipment is housed in a steel cabinet measuring 17×12×24 in. A switch is located on the side of the cabinet for the primary circuit. Alongside this switch are four jacks into which the two secondary cables are plugged for different working conditions.

The electrode holder is arranged to accommodate from one to six electrodes, depending upon the size of the work. A special feature is the provision of extensive cooling fins, also the arrangement of projections integral with the clamping disks to facilitate loading. The electrodes can be used on iron,

The unit prepares narrow edges as easily as other types of surface

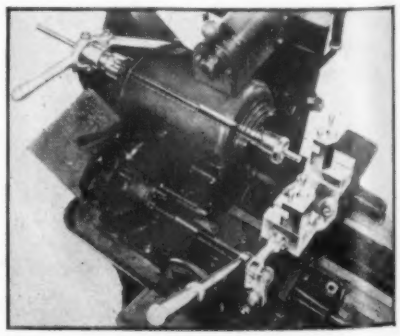
chilled iron, as well as on high carbon, low carbon and alloy steel regardless of hardness. They can also be used on brasses and copper alloys, nickel and nickel alloys.

Loading of the holder is accomplished by loosening the large nut at the end of the stack of clamp disks and inserting electrodes between each pair of disks through the slots in the clamp bolts. The holder is designed so that the electrode may be placed in any position around the bolt. The head of the electrode holder can be swiveled for convenient operation.

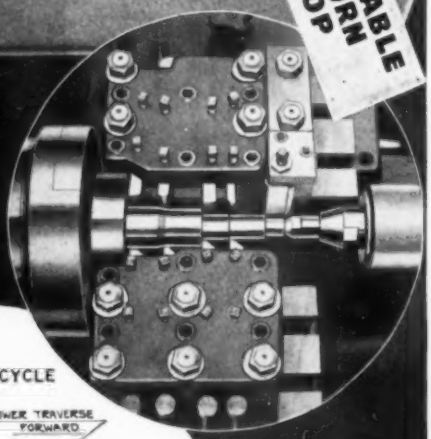
Kessler Lathe Accessories Produce Hand Screw Speeds

Many small and medium size engine lathes can be converted into the speed range of hand production screw machines by the use of two accessories developed by Kessler Aero Products Co., 211 West Palm Ave., Burbank, Calif. One of these is the Aero quick-acting collet-closing attachment which handles accurate duplicate work on bar and tubing stock from 1/32 in. up to ½ in. diameter by chucking and releasing the work while the lathe is running.

The Aero lever-type cross-slide is used in conjunction with the collet closer and provides for forming and

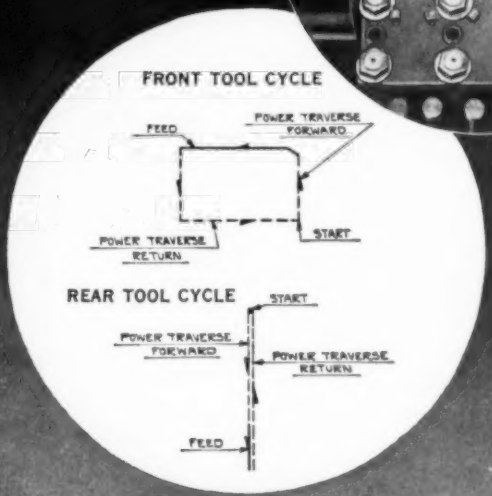


Shift RESPONSIBILITY *to the* MACHINE



Once established to suit the requirements of a particular job, the No. 3A Duomatic automatically controls the diameter and lengths on each successive work piece. The length of forward traverse, the length of feed, pause at end of cut and the return traverse to stop position are quickly and easily established through simple mechanical adjustments. Any combination of turning or straight or angular facing can be obtained front or rear simultaneously or independently, without the use of special or extra attachments.

Write for descriptive Booklet No. 601.



Proudly worn since March 6, 1942

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI, OHIO, U.S.A.

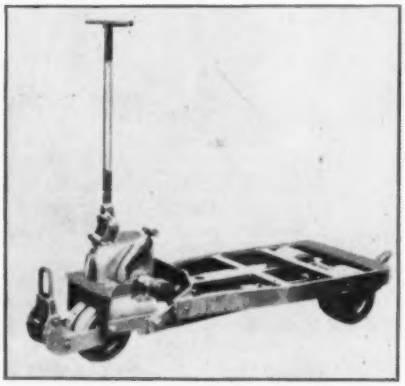
ENGINE TOOL ROOM AUTOMATIC LATHES

fast cut-off. Both attachments may be assembled without machine work or interference with normal operation of the lathe. These accessories are recommended for lathes of ¾ in. spindle capacity.

Yale & Towne Hand Lift Truck Has Couplers for Trailer Use

The Load King trailer-type hand lift truck has been announced by Yale & Towne Mfg. Co., Philadelphia Div., Philadelphia, Pa. It is fitted with safety self-coupler front and rear for trailer use and serves as a hand lift type when not operating as a trailer.

For trailer operation the trucks are merely pushed together. The front end

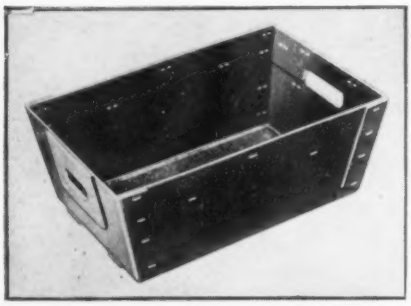


coupler loop slides through the jaw ends of the other coupler, pushing up the latch, which automatically drops into the locked position. To disconnect the train the operator steps on the pedal pad of the latch casting.

This truck elevates the full load by a few strokes on the lift truck handle and deposits the platform load by a treadle action.

Arvey Makes Fiber Toter For Carrying Small Parts

A fiber toter for carrying small machined parts has been developed by Arvey Corp., 3462 N. Kimball Ave., Chicago, Ill. It has considerable resist-

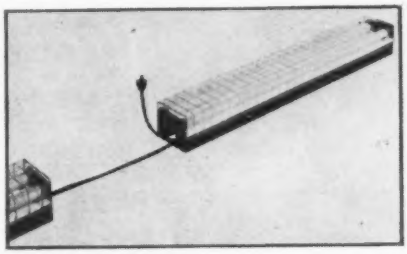


ance to water and oil and thus serves as a receptacle for greasy castings and parts. It is said that the material used in this tray does not dent. Three sizes are available, the largest measuring 21¾ × 13¾ × 10 in.

Lumidor Double-Circuit Light Has Power Tool Connection

A double-circuit mechanic's light is being produced by Lumidor Manufacturing Co., 3120 E. Pico Blvd., Los Angeles, Calif. It is equipped with receptacle for plugging in small power tools and additional fixtures. As many as four lights can be connected in line to a maximum of 60 ft. from a single outlet.

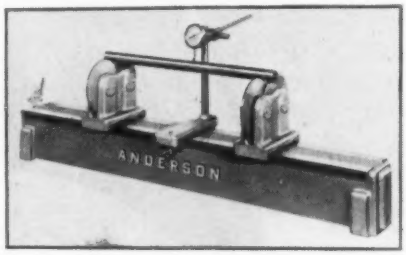
A 24 in. unit containing two 20-watt



lamps, and a 48-in. unit containing two 40-watt lamps are offered. Both units are available for 50 or 60 cycle current. Standard equipment includes brackets for hanging and a hinged wire lamp guard.

Roto-Checker Takes Pieces Having Same Diameter at Ends

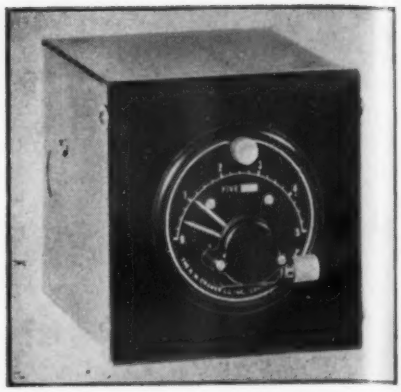
For speedy checking of straight shafting, tubing or pieces that have the same diameter at both ends, Anderson Bros. Manufacturing Co., 1907 Kishwaukee St., Rockford, Ill., has brought out a Roto-Checker. The work is



mounted directly on the disks which rotate in ball bearings. The cast iron base is scraped to precision, and supports a slidable dial test indicator stand. Work 36 in. in length can be handled by this Roto-Checker, but larger sizes can be furnished to meet requirements.

Cramer Reset Type Timers Have Wide Applications

The RS4 and RS5 synchronous motor-driven timers of the reset type, available for time ranges up to 5 hr., have been developed by R. W. Cramer Co., Inc., Centerbrook, Conn. The timers have a wide application for timing electrical circuits such as heating processes and automatic timing of machinery operations. The time cycle repeats upon manual operation of a start button and



indicates by means of a progress indicator the expired and unexpired time cycle, and the setting time as well.

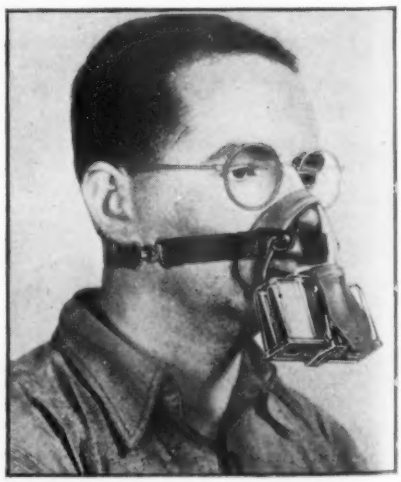
The RS4 units have a double-throw switch and start by pressing and then releasing the start button, which also resets the timer. On the RS5 type, when the button is depressed, it is mechanically held in a neutral position and starts the timing cycle when the start button is pulled outwardly. Both timers operate a single pole, double-throw switch with capacity of 10 amp. at 115 volt, or 5 amp. at 220 volts a.c. non-inductive loads. They will control a 1/3 hp. motor load, a heater load up to 1,200 watts, a lamp load up to 250 watts, or a relay load which does not exceed 15 amp. inrush at 115 volts.

These timers are furnished in a black Bakelite case suitable for flush panel mounting. The over-all length is 4½ in. and diameter is 3¼ in.

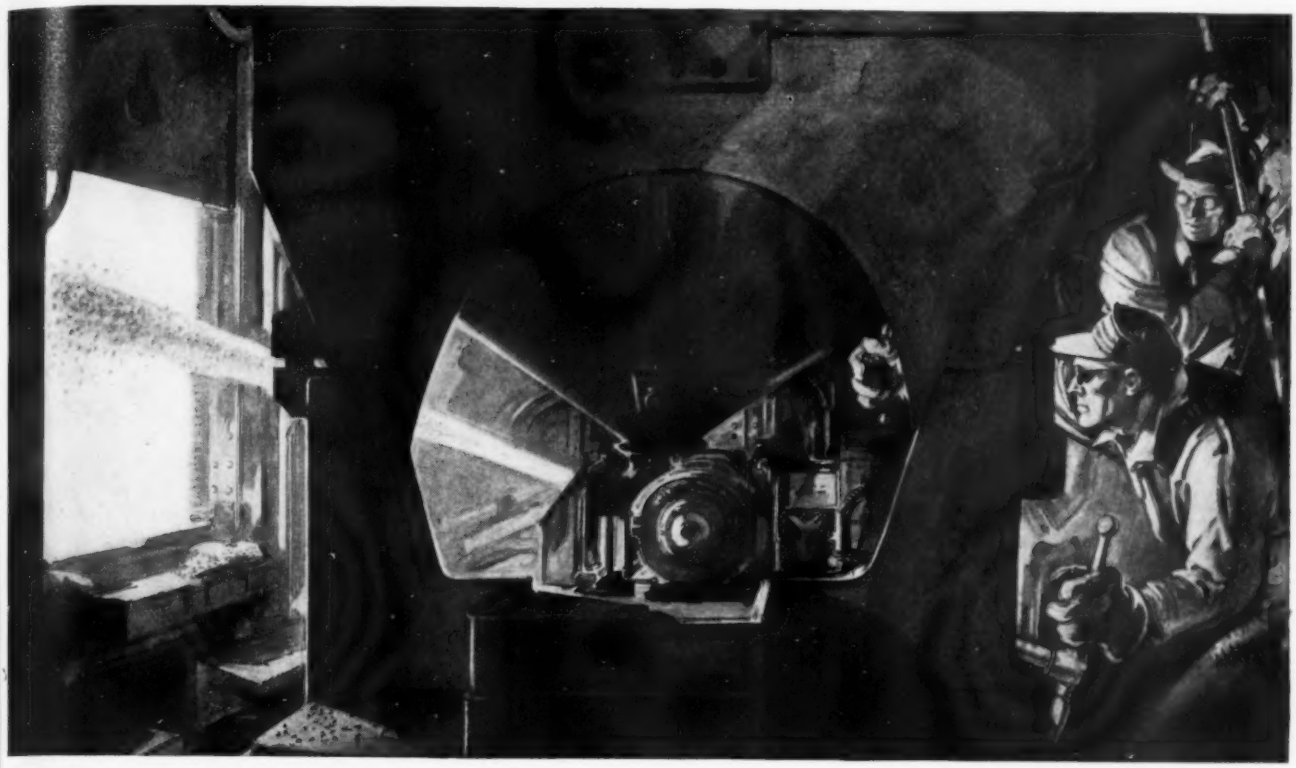
Clear-Vue Dustfoe Respirator Now Made in All-Plastic Model

The Clear-Vue Dustfoe respirator made by Mine Safety Appliance Co., Braddock, Thomas and Meade Sts., Pittsburgh, Pa., is now available in an all-plastic model. It is light in weight and made of transparent plastic, non-corrosive, odorless, and a non-conductor of electricity and heat. The unit protects against toxic dusts, such as lead, cadmium, and manganese.

The self-adjusting facepiece has a form-molded sponge-rubber face



By being watchful over many things, J&L men are producing more steel for war



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FROM AN ORIGINAL DRAWING BY ORISON MACPHERSON

DOLOMITE GUNS IN ACTION AT OPEN-HEARTHS HELP MAKE RECORD WAR-STEEL PRODUCTION

Skilled open-hearth men know the exact spots where the churning, boiling metal and slag begin eating away destructively at the dolomite hearths of their furnaces. Instantly, as each batch of steel is poured, these men swing into action with their dolomite guns. While the empty furnace is held at full temperature they shoot streams of the prepared dolomite at the white hot walls and bottom quickly building up the worn spots. Within minutes a new batch of fighting steel is in the making.

Minutes to these men are priceless—for, at the industry's present high rate of production, every minute steel enough is produced to build five army tanks. America's steel mills are producing steel faster today than at any time in history—steels that are providing our fighting men with equipment and weapons to crush enemy forces and protect our own.

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH, PENNSYLVANIA

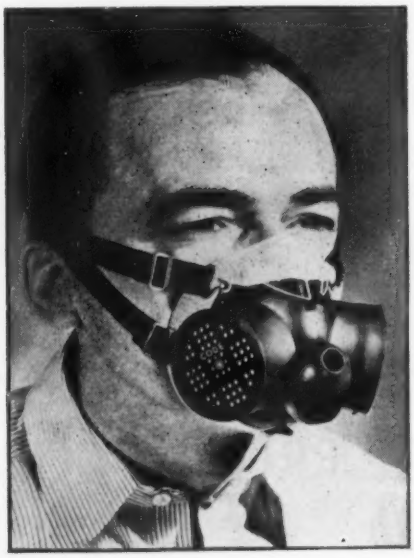
CONTROLLED QUALITY STEEL FOR WAR

J&L STEEL

cushion, and an Army-type exhalation valve provides immediate drainage of any condensation from the facepiece. The headband parts are also of plastic. All parts of the Clear-Vue are interchangeable and can be washed and sterilized, with the exception of the single filters which permit a new one with each cleaning. This respirator permits unobstructed downward and sidewise vision.

Cover Respirator Is Equipped With Colored Plastic Cartridge

The Dupor No. 10 chemical cartridge respirator introduced by H. S. Cover, South Bend, Ind., is equipped with cartridges made of colored plastics. This respirator serves for protection against paint and lacquer spray, chemi-

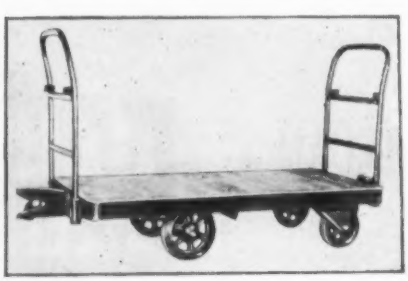


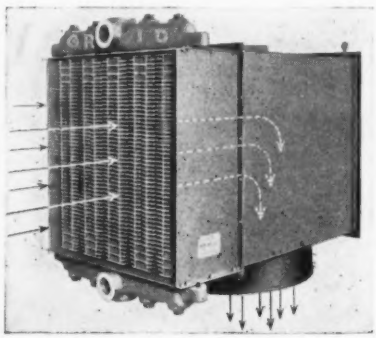
cal fumes, and nuisance gases as well as smoke. The cartridges are easily disassembled to replace filter pads. White, black or yellow plastic cartridges are furnished.

The facepiece is made of molded rubber and gives an airtight fit. An adjustable headband holds the respirator in place.

West Bend Trailer Truck Is Equipped With a Hitch

West Bend Equipment Corp., West Bend, Wis., has announced the Weld-Bilt trailer truck for hand use. The angle frame is rounded at the corners, and has two longitudinal angle supports, and two angle cross braces. The truck has roller bearing wheels, and double ball-race swivels. For trailer use the truck is equipped with a hitch that couples automatically by impact, which can be released by pressing a latch at the top of the hitch with hand or foot. This truck is available in sizes and types for all needs.





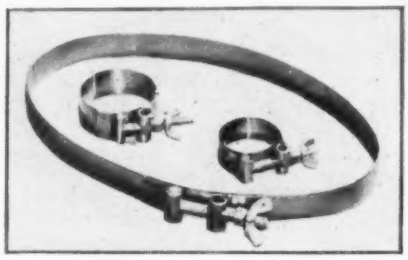
Murray Grid Unit Heater Uses Down-Blow Principle

The Grid unit heater announced by D. J. Murray Manufacturing Co., Wausau, Wis., features the down-blow principle. The motor of this unit is protected from the radiant heat of the unit itself and thereby preventing burning out of the motor. Each fin heating section is high test iron, cast in one piece, so that only one type of metal comes in contact with steam or hot water.

The arrows on the illustration indicate the direction of the flow of air into, through and out of the unit.

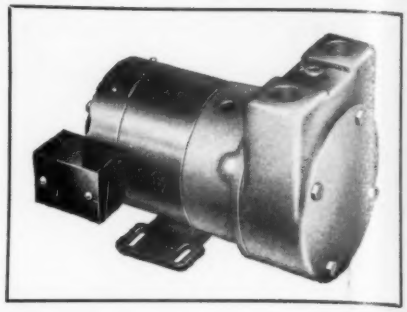
Marman Air and Oil Duct Clamp Conforms to Convex Surfaces

A light-weight air and oil duct clamp made for high-pressure hot or cold installation for aircraft, automotive, tank or marine engine assembly has been



developed by Marman Products Co., Inglewood, Calif. Diameter sizes are 1⅜ to 38 in., and conform to any convex surface, whether square, oblong, circular or triangular.

It is said that this clamp can be easily and quickly wrapped around the hose and duct section without its removal, and tightened the desired amount with one hand, thus saving considerable production time. A positive equalized circumferential loading exerts equal pressure at every point. This clamp can be used over and over.



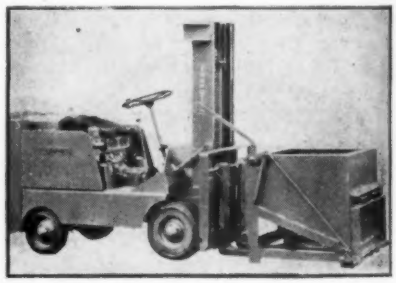
Brady-Penrod Coolant Pump Is Instantly Self-Priming

An instantly self-priming centrifugal coolant pump, known as the Model SP-400, has been announced by Brady-Penrod, Inc., 1220 W. Second St., Muncie, Ind. This unit also reprimes when the sump pump runs dry as soon as it is refilled. It will handle abrasives and steel chips.

The flow of coolant is controlled by a valve at the discharge line, from a few drops per minute to full capacity of the pump without overloading the motor. This pump is a foot-mounted unit.

Towmotor Hopper Attachment Puts Lift Truck to Special Use

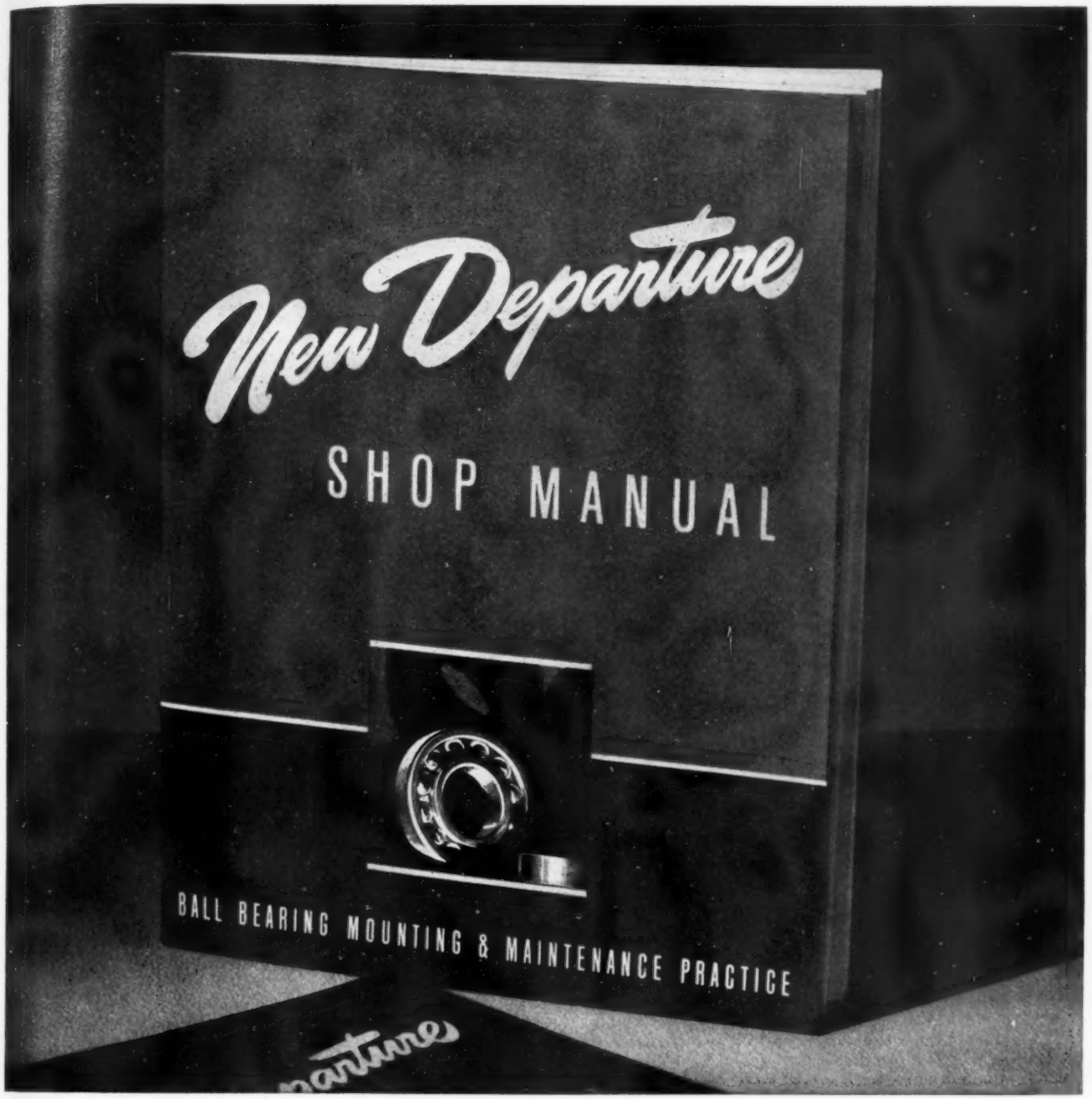
A hopper attachment for standard lift trucks has been made available by Towmotor Corp., 1220 East 152 St., Cleveland, Ohio. This hopper is furnished in various sizes. The attachment is carried directly on the fork support bar of the truck by means of a hook arrangement to provide a firm carrying position and to permit rapid tilting in



dumping hopper loads. Ample clearance beneath the hopper allows handling without removal of standard forks. The hopper gate is opened for discharge by pulling down a hand lever which is in easy reach of the operator. The gate is closed by gravity and secured by an automatic-catch latch. The hopper also serves as an independent unit.

Sterling Grinding Wheel Made to Give Longer Wear

A grinding wheel for use with tungsten carbide metals, drill points, Kennametal and all kinds of steel has been brought out by Sterling Grinding Wheel Div. of Cleveland Quarries Co., Tiffin, Ohio. No steel or rubber are



How to keep 'em rolling . . .

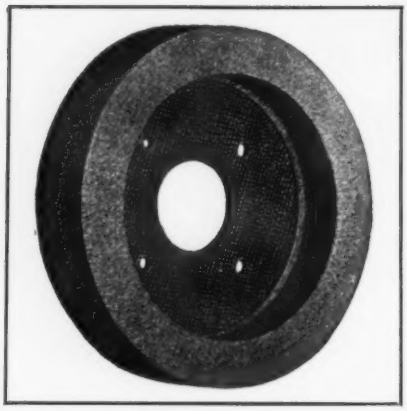
While New Departure's vast productive facilities are giving war projects right of way, New Departure's technical staff has not forgotten its duty to its regular customers.

In fact, both old and new users of New Departure Ball Bearings will find extremely helpful this latest addition to the New Departure Engineering Library—the Shop Manual.

The New Departure Shop Manual should be read by every man responsible for the correct installation of ball bearings for maximum service and long life. Send for your copy and tell us how many additional copies would be required to supply your interested personnel. New Departure, Bristol, Connecticut.

NEW DEPARTURE BALL BEARINGS

3148



used in this wheel. It is said that the flexibility and light weight of the material from which the back plate is constructed will lengthen the life of the wheel and improve its cutting action.

Matthews S-22 Synthetic Stamp Unaffected by Acid Etching Ink

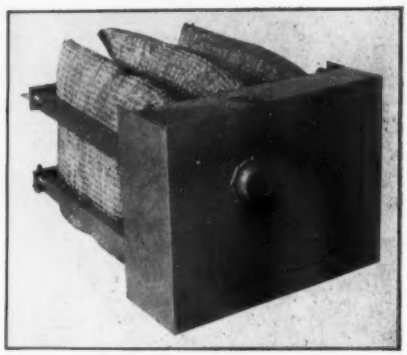
Announcement of the S-22 synthetic stamp has been made by Jas. H. Matthews & Co., 3942 Forbes St., Pittsburgh,

Pa. This synthetic stamp is unaffected by acid etching ink. It is useful where large volume inspection and product control stamping is required. The shape and construction make it easy to handle and store. A pin is provided to hold the stamp in place.

Metex Coolant Strainers Meet Heavy-Duty Requirements

Two super-capacity types, Models G and H, Metex coolant strainers for internal and external grinder and screw machine uses have been brought out by Metal Textile Corp., Orange, N. J. The Model G unit, designated as the Grinder Model, prevents chips or particles from being recirculated in the coolant flow. It is formed by a combination of three filter elements held side by side by thumb nuts making removal and replacement easy. When installed in the sump tank, before the circulating pump, it offers the additional advantage of keeping the pump free of chips or lint. Capacities of this model range from 15 to 60 gal. per min.

In cases where the size of the coolant tank will not accommodate a triple unit filtering strainer, the single unit, Model H, may be used. Or where capacity requires more filtering elements, as many as required of this model may be installed in any position in the tank

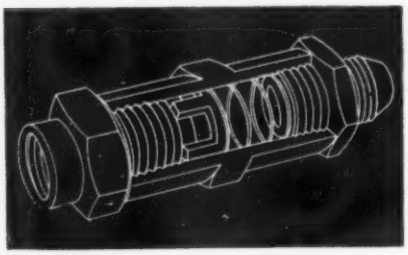


where space is available. Capacities of this strainer are from 5 to 20 gal. per min.

Both types require only one pipe connection for installation.

ASP Airplane Check Valve Permits Twelve Combinations

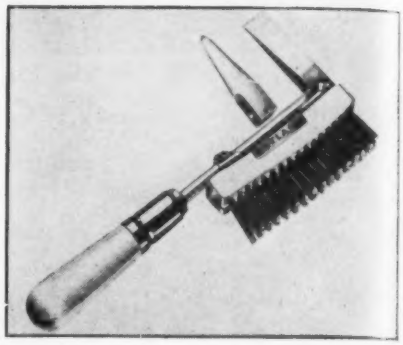
A universal check valve that allows twelve combinations to be made with one body and any two of three types of adapters has been introduced by American Screw Products, Los Angeles, Calif., under the trade name ASP. It has been designed primarily for installation in airplane hydraulic lines. Each end of the valve body is seated with a phenolic poppet. Adapters are available for flared tubing or external and internal pipe threads. A standard body can be assembled with two of three



types of adapters to meet the requirements of any combination of tubing or pipe connectors or direction of fluid flow. It is said that the ASP valve is unaffected by vibration, acceleration, or variable pressures.

Atlas Weld Cleaning Tool Has Combined Brush and Bit

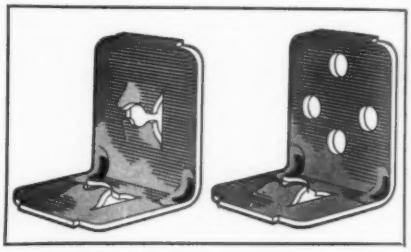
Announcement has been made by Atlas Welding Accessories Co., 307 Boulevard Bldg., Detroit, Mich., of the Dual-Tool weld cleaning tool. It combines a wire



bristle brush and a slap-removing bit in one unit and features a brush holder which permits removal of the brush by reversing or replacement by inserting a sharp object, such as a screwdriver at the rear end of the holder. An up and outward pry releases the tension. All parts of the tool are replaceable.

Tinnerman Angle Bracket Has Integral Speed Nut

A combination bracket and fastener for angular attachments in aircraft and other equipment has been brought out by Tinnerman Products Inc., 2102 Fulton Road, Cleveland, Ohio. The bracket features an integrally formed speed nut in one or both sides of the bracket. It



is made for 8Z and 10Z Air Corps sheet metal screws and standard rivets. When used in connection with conduit and piping, this bracket permits the use of standard bonding clamps in place of ear-type aluminum clamps.

Universal Engineer's-Glass Used for Drawing Diagrams

Announcement of engineer's-glass in translucent and transparent form has been made by Industrial Engineer's Specialties Div., Universal Engraving & Colorplate Co., 1919 East 19th St., Cleveland, Ohio. The translucent engineer's-glass is a thin vellum drawing paper cemented to one surface of smooth-edged plate glass ⅛ in. thick. It serves for drawing diagrams in pencil prior to inking in for the preparation of reproduction. This glass can also be used as a temporary comparator chart. Since the penciled designs can be easily erased, one sheet of the glass can be used repeatedly.

The engineer's-transparency is available in either ground or clear glass. The black image is on the ground glass side of plate glass and is ready to be

DO'S AND DONT'S IN HOBBING WORM GEARS

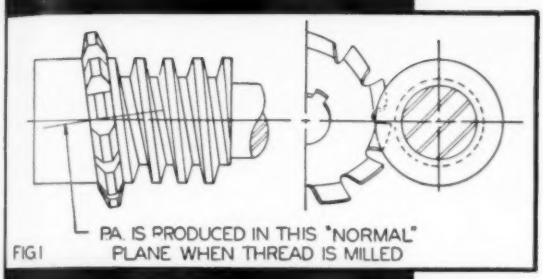


FIG 1

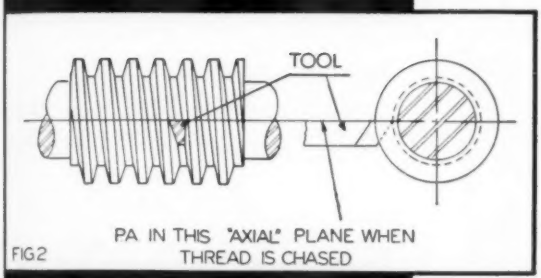


FIG 2

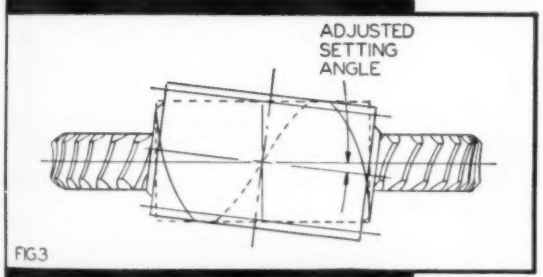


FIG 3

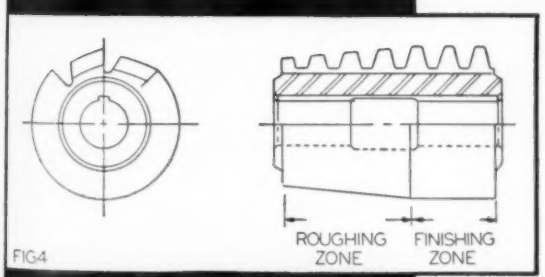
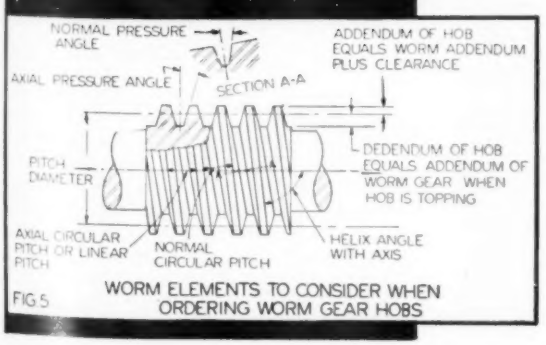


FIG 4


NORMAL PRESSURE ANGLE
AXIAL PRESSURE ANGLE
SECTION A-A
ADDENDUM OF HOB EQUALS WORM ADDENDUM PLUS CLEARANCE
PITCH DIAMETER
DEDENDUM OF HOB EQUALS ADDENDUM OF WORM GEAR WHEN HOB IS TOPPING
AXIAL CIRCULAR PITCH OR LINEAR PITCH
NORMAL CIRCULAR PITCH
HELIX ANGLE WITH AXIS
FIG 5 WORM ELEMENTS TO CONSIDER WHEN ORDERING WORM GEAR HOBS

You can save time in securing the right tools for your specific job; you can increase cutter life and reduce tool cost; and you can get a better job by observing a few simple fundamentals.

GENERATING METHODS FOR WORMS

1. THREAD MILLING: Remember that a 29° angle on the cutter will produce a 14½° pressure angle in the *normal* plane (Fig. 1).
2. THREAD CHASING: This method with a 29° tool produces worms with a 14½° pressure angle in the *axial* plane (Fig. 2).
3. HOBBING: A hob with a 29° tooth in the normal plane produces a worm with a 29° tooth or a 14½° P.A. in the *normal* plane.

INFEED HOBBING OF GEARS

1. To provide tool life, infeed hobs should be made oversize to allow for sharpening.
2. The greater the amount of oversize the less the bearing area on the gear.
3. When an oversize hob is used it should be set slightly off 90° in the hobbing machine to avoid a 'crossed' bearing. The amount depends on amount of oversize (Fig. 3).
4. Once the pitch diameter is less than that of the worm, the hob will produce a pinched bearing, making it useless.

TANGENTIAL FEED HOBBING

1. Best suited to production of accurate worm gears (Fig. 4), because it operates at exact center distance with less tendency toward "destroying" action in the cutting.
2. Less oversize required than for infeed hobs, thereby permitting setting to more nearly correct angle on machine when hob is new.

WHEN ORDERING

When ordering hobs always include a print of the worm and gear and indicate rotation and direction of feed of the hobbing machine. Specify whether pressure angle of the worm is in the normal or axial plane. Always give *pitch diameter* of worm. This will insure your getting the right kind of a hob for your job (Fig. 5).

If you do not already have a copy, send for a practical booklet for shop and tool design department use. Ask for "Hobbing" booklet No. 149-A.

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7171 E. McNICHOLS RD. • DETROIT, MICH., U. S. A.

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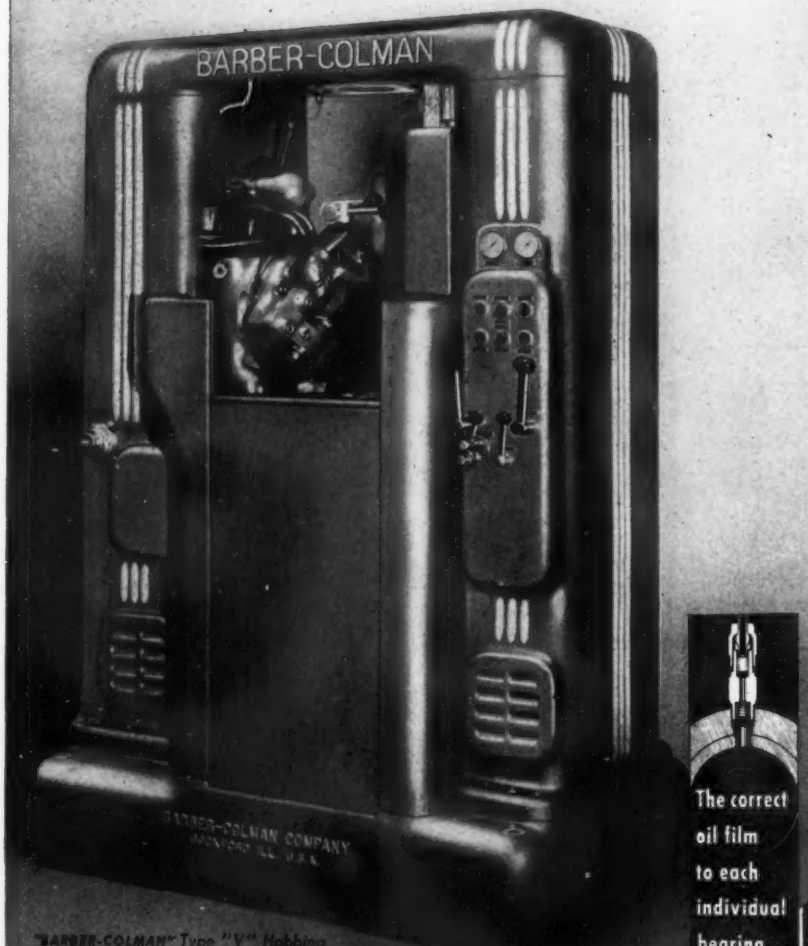

"BARBER-COLMAN" Type "V" Hobbing Machine . . . Bijur Lubricated.

The correct oil film to each individual bearing... *automatically*

Machine accuracy is maintained at maximum by Bijur lubrication. This centralized forced-feed system promotes better-quality work . . . higher speeds . . . bigger production at lower cost . . . longer-lived machines. Each bearing is fed *automatically* — the exact, metered oil-film demanded by its size, speed, load. Bijur lubrication is engineered to modern machine standards!

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placed on the transparent viewing screen of a comparator with the image and ground glass side away and in contact with the viewing screen.

The image made on the clear glass is used on comparison projector equipment employing a ground glass inspection screen. If the master drawing on engineer's-glass becomes damaged, duplicates can be made directly from the engineer's transparencies. The transparencies can be made up in different colors if desired, the original designs on engineer's-glass being made in the same manner as that for the one-color charts.

Both types of engineer's-glass are also available in circular form. When a number of small parts are to be checked, it is possible to have several diagrams drawn on one circle so that as each part is checked on the resulting engineer's-transparency the glass can be revolved.

NEW MATERIALS

Colorthru Ready Mix Paint Gives Finish Coat on Masonry

A ready mixed primer and paint called Colorthru has been announced by Colorthru Chemical Co., 20 W. 45th St., New York, N. Y., which is a finish coat in color for masonry. One coat brushed or sprayed on floors and walls penetrates, preserves and waterproofs brick, stucco, and cement. The coating can be applied to old or new masonry even when wet. It is said to be quick-setting and resistant to acids.

Durashield Laminated Plastic Replaces Metal in Nameplates

Durashield, a product of Plastic Fabricators, Inc., 500 Sansome St., San Francisco, Calif., serves as a substitute for brass, copper, or bronze nameplates, tool checks, dial faces and similar marking plates on machinery and metal equipment of many kinds. It is a laminated plastic, the center sheet being 0.010 in. thick with a transparent acetate plastic 0.020 in. thick on each side. The product can be die cut, drilled, or stamped. This material is fire resistant and is said to withstand temperatures of 200 F., and has been made available in colors.

Calumet Liquid Plastic Paint Seals Cracks and Joints

A liquid plastic paint that expands and contracts with changing temperatures has been developed by Calumet Plastic Co., Inc., 4702 Calumet Ave., Hammond, Ind. Cracks, splits and joints of reasonable size remain sealed by this plastic bond. The painted surface is nonporous and is said to be impervious to penetration of dirt and moisture. It is applied by brush or spray and is washable.

TRADE PUBLICATIONS

CHAIN DRIVES Seven servicing suggestions that will make any chain drive run better and last longer are given in Folder No. 1951, "First Aid For Faithful Chain Drives," published by Link-Belt Co., 307 N. Michigan Ave., Chicago. Ill.

CONTOUR SHAPING Bulletin No. 5, describing how Duplimatic, an automatic machine tool control, permitted standard shapers to do high speed automatic shaping, is offered by Detroit Universal Duplicator Co., 723 E. Milwaukee Ave., Detroit, Mich.

FURNACES Bulletin SC-106, issued by Surface Combustion, Toledo, Ohio, features standard heat treating furnaces in war production.

INDUCTION HEATING "Faster Production With Tocco," is the title of the comprehensive 16-page booklet released by The Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio, describing the operating principles in hardening, brazing, annealing and heating metal with this process of induction heating.

TOOL CHESTS Specifications and prices of tool chests are given by George Scherr Co., Inc., 128 Lafayette St., New York, N. Y., in a 4-page folder.

TOOL SALVAGING The Eutectic Welding Alloys Co., 40 Worth St., New York, N. Y., has prepared for distribution to war plants an instructive poster on tool salvaging.

TRANSFORMERS Dry-type transformers for power and lighting circuits 600 volts and below are described and illustrated in 19-page catalog GEA-897-J published by General Electric Co., Schenectady, N. Y.

VALVE OPERATOR The Automatic Temperature Control Co., Inc., Philadelphia, Pa., has prepared Catalog A4 covering the Type 2 valve operator. This folder lists applications, design features and functional data. Electrical and mechanical details are easily obtainable by reference to the diagrams and tables.

VALVES A line of portable electric magnetic valves which resist vibration and change of motion as well as operate in any position is completely described in Bulletin S-304 issued by General Controls Co., 801 Allen Ave., Glendale, Calif.

WEIGHTS The sixth edition of the "Weights and Data Handbook" of copper, brass and bronze products, published by Revere Copper and Brass, Inc., 230 Park Ave., New York, N. Y., includes a new section giving technical and mill definitions and illustrations of

McCROSKY Super Adjustable Reamers conserve time and high-speed steel, give extreme accuracy. Thanks to the SUPER design, the inserted blades can be adjusted quickly and uniformly, with a minimum of blade stock sacrificed in resharpening. And the rugged SUPER body is good for many sets of replacement blades.

Full details in McCrosky Bulletin 16-A. Grinding instructions in the McCrosky Reamer Manual.

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EASY TO USE . . .
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Because each blade in the Lufkin Set of Radius Gages is a separate unit, it can more easily and accurately be applied to the work. The other blades can't interfere in any way. Each blade has five separate applications of its individual radius—and carries the corresponding external and internal forms. The durable leatherette folder is arranged for most convenient handling of complete set, and the Lufkin Gage Holder (supplied for slight additional cost) is ideal for working in those hard-to-get-at places.

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terms used in the copper and brass industry. All chemical and physical properties have been revised to date, additional formulas have been included for calculating weights, and other formulas have been simplified.

WELDING Specifications and price list of resistance welding electrodes is available from Tipaloy Inc., 1435 East Milwaukee, Detroit, Mich.

WELDING The "Suttonizing" welding process is illustrated and described in the 27-page booklet entitled "Reclamation by Welding of High Speed Steel Tools" issued by the Welding Equipment & Supply Co., 223 Leib St., Detroit, Mich.

NEW BOOKS

MACHINE DESIGN—*By P. H. Hyand, professor of machine design, University of Wisconsin, and J. B. Kommers, professor of mechanics, University of Wisconsin. Third Edition. 562 pages. Published by McGraw-Hill Book Company, Inc., New York and London.* $4.50.

In the third edition of this standard textbook a number of changes have been made to bring about clear presentation. However, the same subject matter is presented in the same order. Where new material has been added, old material has been omitted to keep the size of the book within the limits of the second edition. All problems in this edition are new and intentionally short. The answers to many problems are given.

•

FUNDAMENTALS OF ELECTRICITY FOR THOSE PREPARING FOR WAR SERVICE—*By Wynne L. McDougall, head, department of electricity, Pullman Free School of Manual Training, Richard R. Ranson, engineering department. Cutler-Hammer, Inc., and Carl H. Dunlap, head, electrical engineering department, American School. 388 pages. American Technical Society, Chicago.* $2.

This is another volume in the publisher's Preinduction Training Series designed to meet the requirements of the War Department for ratings as automobile, airplane, and engine mechanic; telephone and telegraph linemen and operators; ammunition handlers; construction foremen; radio operators; mechanics and repairmen; fire control instrument operators; motorcyclists; antitank gunners; and electricians.

It is presented in a "how to do it" method. The text is accompanied by a work book containing a series of elementary projects to be worked out by the student. The text is clearly illustrated. Much of it is taken from "Applied Electricity" by the same publisher.

TIME STUDY FOR COST CONTROL—*By Phil Carroll, Jr., management consultant. Foreword by C. D. Dyer, Jr., president, Dyer Engineers, Inc. Second edition.* 301 *pages. Published by McGraw-Hill Book Co., Inc., New York and London.* $3.

The second edition of this standard text for practicing timestudy men and students has been revised and brought up to date. Suggestions from readers have been incorporated, and new material from recent developments has been added. The author's activity in the Society for the Advancement of Management has resulted in the expansion of two important parts of the mechanics of timestudy, into separate chapters on "Element Timestudy" and "Rating the Timestudy." Like the first edition, the new version includes a "Manual of Reference Data" containing a glossary, bibliography and 24 pages of appropriate tables.

•

PRACTICAL ENGINEERING PROBLEMS AND THEIR SOLUTION—*F. H. Higgs,* 48 *pages. Published by Longmans, Green & Company, Inc.,* 55 *Fifth Ave., New York, N. Y.* $4.

This book is intended to assist the practical engineer and mechanic to solve many engineering problems. It contains the most essential items associated with shop mathematics. The practical examples, together with illustrations, should overcome difficulties in applying theoretical knowledge. Tool room operators will find the data on developments valuable, since many of the problems are apropos of present-day production methods.

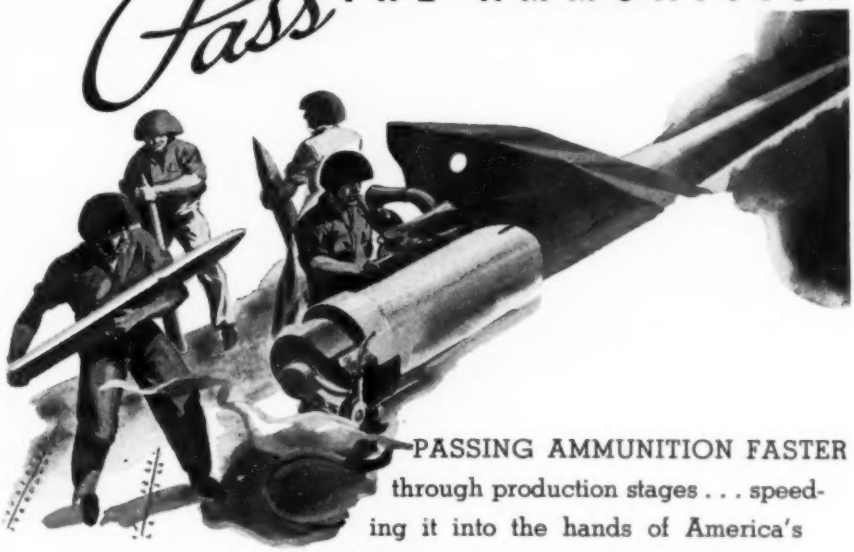
The problems presented by the author include those in which a knowledge of fractions, decimals, square root, plain geometry and solid geometry are required. In addition, there is information on mechanical drawing. Tolerances for five different types of fits are given in text and tabular form.

•

THE FOREMAN'S HANDBOOK—*Edited by Carl Heyel, Union Bag and Paper Corporation, assisted by a staff of specialists.* 410 *pages. Published by McGraw-Hill Book Company, Inc. New York and London.* $3.

Though it emphasizes the kind of practical information a foreman needs in his work, this handbook was designed to be more than the usual book on foremanship. The eighteen chapters that make up the text are written by experts in the particular subjects drawn from industry, the universities, the trade papers and other educational fields. The editor, who is also the author of the introductory chapter "A Breakdown of the Foreman's Job," is on the management staff of the Union Bag & Paper Corporation. Other representative contributors are T. O. Armstrong,

..and *Pass* THE AMMUNITION



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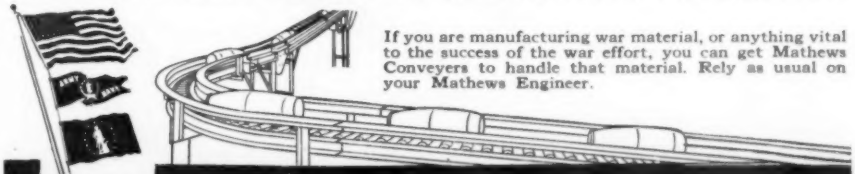

If you are manufacturing war material, or anything vital to the success of the war effort, you can get Mathews Conveyers to handle that material. Rely as usual on your Mathews Engineer.

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W-S Standard Reamers with carbide tips. Tapered shank (illustrated) and straight shank types. Sizes: ¼ to 1½.

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REAMERS and many other cutting tools formerly in the "special" class are now STANDARD with us. The majority of these STANDARD cutters is in stock *most of the time.* Our broad line often enables the consolidation of tool orders and saving of valuable time. Each W-S tool is genuine CARBOLOY tipped. The grade used is the one best suited to do a cutting job on the metals for which the tool was ordered. (Other brands of carbide can be specified.)

Carbide tipped tools are not just a specialty with us . . . we make them *exclusively.* You can *expect* and *get* uniform, high quality results with W-S tools. Write for new FREE Catalog 942 and latest prices. WENDT-SONIS COMPANY, HANNIBAL, MISSOURI.

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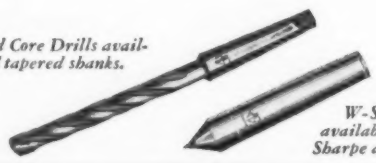
W-S Carbide Tipped Core Drills available in straight and tapered shanks. Sizes: ½ to 1½.



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manager of the industrial relations department of the East Springfield plant of the Westinghouse Electric and Manufacturing Company; H. P. Dutton, professor of business management, Illinois Institute of Technology; Lydia G. Giberson, industrial psychiatrist, Metropolitan Life Insurance Company; Howard W. Haggard, director of the laboratory of applied physiology at Yale University; Robert O. Pickard, personnel director, Aluminum Forgings, Inc.; and Lewis K. Urquhart, managing editor of *Factory Management and Maintenance.*

The book is comprehensive in its coverage of the general subject. It has chapters on all phases of the work, from direct day-to-day responsibilities of the foreman in handling people and supervising production to the background of economic and management fundamentals. Though it has been planned for peacetime as well as wartime use, special attention has been given to new aspects of the foreman's job which have developed as a result of war-scale production. Among these are the sections on the "Foreman's Training Responsibilities" by Glenn Gardiner, on "Industrial Fatigue" by Dr. Haggard, and the very excellent one on "Special Problems in Supervising Women" by Dr. Giberson. Though these are special wartime problems, they will still be live interests after the war.

In style and presentation the authors have achieved a fine balance between breezy journalism and dry-as-dust academic papers. Each chapter is rich in information while still being easy to read. Thought it runs to over 400 pages, the book is a handy size and is bound in a limp cover so that it is convenient to use as a shop reference volume.

•

INDUSTRIAL INSPECTION METHODS—*By Leno C. Michelon, War Training Division, Illinois Institute of Technology. 389 pages. Published by Harper & Brothers, New York and London.* $3.50.

This book was developed at Illinois Institute of Technology for the training of junior inspectors for the Chicago Ordnance District. As such it has been worked out with the cooperation not only of the school but of the Army and the manufacturers. It presents a complete survey of the field, covering all forms of inspection tools from the simplest scales and calipers through precision tools, inspection gages and gage blocks to involved comparators and electrolimit gages. Descriptions and illustrations of the many varieties of each type of tool are given, as well as detailed instructions in the use of each tool through numerous illustrative problems. In such fields as thread and gear inspection, taper inspection and the use of the sine bar in measuring angles, the necessary formulas and mathematical computations are presented.

Besides the dimensional control of

parts of any shape, the book treats testing for physical properties, including X-ray and magnaflux inspection, and the inspection of surfaces with the profilometer, micrometer, microinterferometer, dynamometer and optical methods.

In chapters on statistical methods of product sampling and the organization of an inspection department, the author discusses the place of inspection in industrial organization. In this section, he treats of methods of inspection, inspection personnel, factors affecting inspection efficiency, types of inspection and general organization.

Though problems are not bound into the present edition, they are available from the publisher. The book is bound with a limp binding and a soft back so that it will lie flat on desk or work bench and is made suitable for use as a manual by the inclusion of the necessary tables in an appendix.

SEEN and HEARD

By JOHN R. GODFREY

Models or Drawings

Women's bonnets are not the only fashions that change in cycles and that repeat after many years. Years ago, before we had blueprints as cheap and rapid reproductions of drawings, we worked from sample parts of valves or whatever was to be made. There was, of course, many chances of error as to dimensions for different men do not measure exactly alike, even with micrometers, and fixed gages were few and far between except as to profiles for parts of guns or sewing machines.

Now we find models being used again in some phases of the industry, not because the men cannot read drawings but because the model gives a better idea of the actual piece than the average man can grasp from drawings on a flat plane. This is true not only of parts of machines but of representations of machines in laying out or rearranging a plant.

By having models which represent each machine so far as outside dimensions go, it is much easier to arrange floor layout and allow headroom for cranes, overhead conveyors and the like. And when it comes to assembling parts of planes, or ships or other mechanisms, sectional models are found to have many advantages.

Suggestion Box Systems

Firms which install suggestion systems with the idea that they will run themselves are not only doomed to disappointment but are also likely to stir up a hornet's nest of trouble and resentment. Unless you are prepared to have every suggestion studied by competent men it is better not to ask for them. Every suggester thinks he has a good idea. If it is "dud" he must be

LET'S HELP UNCLE SAM

On this man power question, Uncle Sam needs your help . . . everybody's help!

He is faced continuously with the growing problem of greater production and a bigger Army and Navy.

The draft boards are handling the matter of men for our armed forces effectively. Where Uncle needs your help is in making more men and more women available for production. You can help by reviewing:

1. ABSENTEEISM—**Get the percentage of absenteeism in your business today, compared to a few years ago. Review your personnel policies, hours of work and safety records.**

2. UTILIZATION—**Are you hoarding labor? Many war plants maintain at all times, an excess labor supply of from 10% to 25% . . . dangerous in peacetime and *unpatriotic hoarding* in wartime.**

Are you planning and scheduling your work to conserve labor? Do you have sound material control? Do you practice preventive maintenance? A man who is waiting for a job, for tools, for materials, for a machine to be repaired, is not being utilized. This is lost man power, because more men are then needed to produce what one man could.

I am proud to say that every day our organization is helping our clients to better utilize their man power. Perhaps we can help you.

Geo. D. Trundle Jr.
President

THE TRUNDLE ENGINEERING COMPANY

Consulting Management Engineering

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CHICAGO · City National Bank Bldg. · 208 S. La Salle Street
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CONSERVE machine efficiency! *Babbitt-tipped* Laminum shims, for pressure-lubricated systems, prevent oil and pressure losses. Body of shim retains all Laminum features of quick precision adjustment by *peeling* . . . in factory assembly or field service.

The .003 or .002 in. laminations are bonded into a solid unit . . . easy to peel.

Laminum shims are cut to your specifications. For repairs or maintenance, get stock shim materials from mill supply dealers. (Write us for illustrated shim application file-folder and Laminum sample.)

Laminated Shim Company
Incorporated
50 Union Street Glenbrook, Conn.

it's
LAMINUM
THE SOLID SHIM THAT peels FOR ADJUSTMENT

told why it cannot be used, in a tactful and convincing manner. Nor is any one man often capable of passing on all suggestions. Men who are familiar with the different kinds of work should be consulted before a suggestion is turned down.

One large concern in the airplane field has two engineers assigned to work full time on the ideas suggested. These men in turn consult leading men in the different departments as to the practicability of ideas affecting their work. For the past six months this plant has had over 100 suggestions a week. A little over 10 percent have received awards and a similar number have been placed on an Honor Roll which denotes merit to their ideas which were not of a kind to affect production. Suggestion systems can be productive of increased output and can build good will. But they must be taken seriously and not neglected in any way.

Wasted Machine Capacity

The machine tool industry has done an amazing job of expanding its output during the past two years. For an industry that is normally comparatively small, its increase in the number of machines built is most amazing. Unfortunately for all concerned not all of it has been used effectively, to put it mildly. Too much of the machine capacity that has been produced has been placed where it was not necessary.

Some of the most glaring examples have been where precision horizontal boring machines were used on work where all that was needed was some sort of a power head to drive and feed a boring bar, or a milling cutter. One particularly bad case is where two large machines of this kind are installed to bore one hole in each end of a fairly large beam. The beam is held in a fixture which carries hardened bushings for guiding the boring bar. The accuracy does not depend on the boring machine but on the fixture that holds and positions the beam. This is not only an inexcusable waste of money but it has imposed unnecessary demands on the makers of these machines.

Using a precision machine where all the accuracy is built into the fixture is a waste of machine capacity.

Saving Machine Tools

Many precision machine tools have been specified for work on which they were not required. This has been particularly true of horizontal boring machines. While these machines have a wide field of usefulness and can handle many kinds of difficult work, they have been specified in too many cases where they were not needed.

One case in mind is the demand for a very large machine to handle a small boring job on a large piece of work. The machine had to be large enough to hold the huge fixture in which the work was located. This fixture located the work with reference to the bushings that guided the boring bar so that the parts would all be alike. The fixture provided the accuracy—the large, expensive machine simply furnished the power for driving the boring bar. Universal joints between the boring bar and the machine made absolute alignment unnecessary.

Here, as in many other cases, the work could have been done equally well with a portable boring bar, guided by the bushings in the fixture. Precision boring machines have a distinct field in which they are very valuable. They should not be used to simply turn boring bars where the accuracy is provided for by the hardened bushings in the fixture.

Why Different Methods in the Same Shop

Lack of uniform practice in the same shop makes an observer wonder why the more simple method is not used on all operations. Take the ends of the link or articulated rods on radial airplane engines, as an example. Some of the ends of the rod that project above the I-section are milled by rotating the circular table and carrying the rod past the end mill. Others are finished with a sweep cutter under a drill press in much less time. This sweep cutter has a pilot that enters the pin hole in the rod and insures concentricity.

On the same rod a husky broaching machine rough cuts the surplus metal from the sides of the rod that are parallel with the holes. But the ends are milled by the rotary table method as used on the end projections. This takes time as it is a heavy cut. It is hard to see why the side of the rod should be broached and a different method used on the ends. The ends could be broached just as easily as the sides, but probably as a separate operation. For while it would be possible to have the ends broached at the same time, the cost of the broaches and their maintenance, would probably not warrant combining the operations.

Hacksaws as Broaches

Broaching is gradually increasing its field of operations and saving money where the number of pieces to be made warrant the cost of machines and tools. One striking example seen recently is the finishing of the outside of a three-bladed propeller hub. This replaces a profiling machine which formerly milled the contour around the bolt holes. Now a broach does a fine job in machining a long surface at one pass. Then the hub is indexed and the next side machined in the same way.

Another case is where multiple broaches machine four small coupling units at one pass, from square bar stock. These were formerly milled and cut off from extruded stock. Here the

cutting-off tool question was solved in a simple manner. The regular broaching cutters used in cutting off broke with expensive regularity. Now they use standard power hacksaw blades. They grind off the "set" of the teeth until the blade just clears nicely. Then they grind the back of the blade so that each successive tooth can take its share of the cut, as in making broaches. These saws make excellent cutting-off broaches at low cost. They saved the day in getting out these small couplings.

Long Surface Plates

We have always made surface plates of cast iron and it is something of a novelty to see them being made of steel in some places. But the airplane industry has brought us many innovations, of which this is one of the latest. And it has a perfectly logical reason. Not because they thought steel better than cast iron, but because it fitted into their needs better in these cases.

Wanting to check the alignment of long, narrow fixtures, someone not bound by tradition, found that he could get some steel beams of H section that would fill the bill. So he turned the H over on its side and planed the upper surface with the beam supported as it would be when in use. In this way he secured a flat surface that could be depended on. With the beam mounted on suitable supports this beam makes a very satisfactory surface plate for the long, narrow work for which it was made. There may be other cases where beams of this kind can be used to advantage.

Pamphlet Tells Use of Negroes in War Industries

Once an employer has decided to hire a large number of negroes, he must integrate them into his plant exactly as he does white workers, according to an analysis prepared by the New York State War Council.

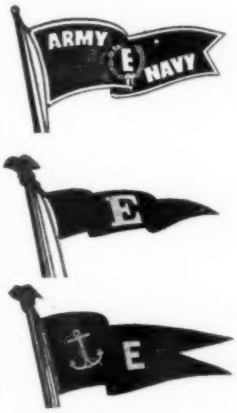
The first step is to train and educate the supervisory staff on whom the real burden of integrating negro workers will fall. Negro white collar workers should be employed first: less resistance will be encountered in the white collar group, and fears of loss of status on the part of white industrial workers will be minimized when it comes their turn to work with negroes.

No racial integration or discrimination should be allowed, either in company, recreational, medical, or cafeteria facilities or in health examinations. Any other policy will lead to a demand for segregation on the production line.

The first negro workers must be carefully selected, otherwise undesirable workers might be hired and cause trouble from the beginning. Negro personnel officers will enable a firm to select the best workers and are an

Women Workers..

now play an important role in WYCKOFF VICTORY PRODUCTION



From dishpans and dust mops to *"smash the axis"* production of fine cold finished steels!

Yes, indeed, the true American spirit! Now approximately 20% of the workers at Wyckoff are women and they are doing a splendid job while Wyckoff men are on fighting duty throughout the world.

This *living, fighting spirit* is traditional at Wyckoff in both men and women . . . as signified by the distinguished joint awards — the Bureau of Ordnance Flag and the Navy "E" Pennant, the All-Navy "E" Burgee, the joint Army-Navy "E" Production Award *with added Star*. These awards are constant reminders of well-done jobs — and still greater accomplishments to which we are pledged, and *will achieve*.

WYCKOFF DRAWN STEEL CO.
First National Bank Bldg., Pittsburgh, Pa.
3200 South Kedzie Avenue, Chicago, Ill.
Mills at Ambridge, Pa., and Chicago, Ill.

Manufacturers of Carbon and Alloy Steels . . . Turned and Polished Shafting . . . Turned and Ground Shafting . . . Wide Flats up to 12" x 2".

WYCKOFF
Cold Finished Steels

SPEED-CUTTING RECORD

A large manufacturer of brass and bronze products has set up a battery of hack saws to operate on an extremely fast production schedule. Because that plant is continually looking for improvements, they investigated Capewell's *Technite* blade. By multiple cutting of 2 3/8" Tobin bronze bars in 23 seconds, *Technite* outcut competition, even when *Technite* was run on the next lighter feed. Capewell precision-cutting hack saw blades may show you similar time and cost savings. Ask your mill supply man today.

The Capewell Mfg. Co., Hartford, Conn.

CAPEWELL

THE TREND IS TO TECHNITE

THE MOLYBDENUM HIGH SPEED HACK SAW BLADE

evidence of the fair attitude of the company.

Counseling the negro workers to avoid behavior which will tend to confirm projudices is desirable and may best be done by a personnel officer of their own race. Aggressive behavior is no more marked among negro workers than white. Absenteeism is no higher, and in some plants is even lower. An appeal to their sense of democracy and fair play will usually remove the prejudices of white workers. If toilets are kept clean and orderly, and if all workers have health examinations and health service, friction in this respect will be eliminated.

Full upgrading opportunities must be provided in order to have a loyal, eager labor force. Regardless of color, the best worker will be accepted by his fellow workers. If the sexes are required to stick to business and avoid social contact during work, many pitfalls will be avoided.

The published analysis is based on a careful study of the manner in which certain large companies are handling the problems arising out of the hiring of large numbers of negroes for the first time and putting them to work in all capacities. It is entitled, "How Management Can Integrate Negroes in War Industries." The 44-page, paper bound pamphlet was published by the New York State War Council as an aid to employment managers in gaining the use of all workers during a time of critical manpower shortage. It seeks by the use of examples and experiences of many firms to illumine the nature of racial factors in industry.

Reamer Pilot Promotes Higher Production

In reaming push-rod bushings in Pratt & Whitney cylinder heads, Ford experienced trouble with the fixture and tool originally supplied. The part was located by a fixture post bearing against the valve-seat insert and a pilot engaging the main bore. Considerable care in loading the work was required, because the reamer had a long pilot that fitted snugly in a bushing in the fixture post. A small amount of misalignment in work loading caused the tool to cut eccentrically. Tool breakage was high.

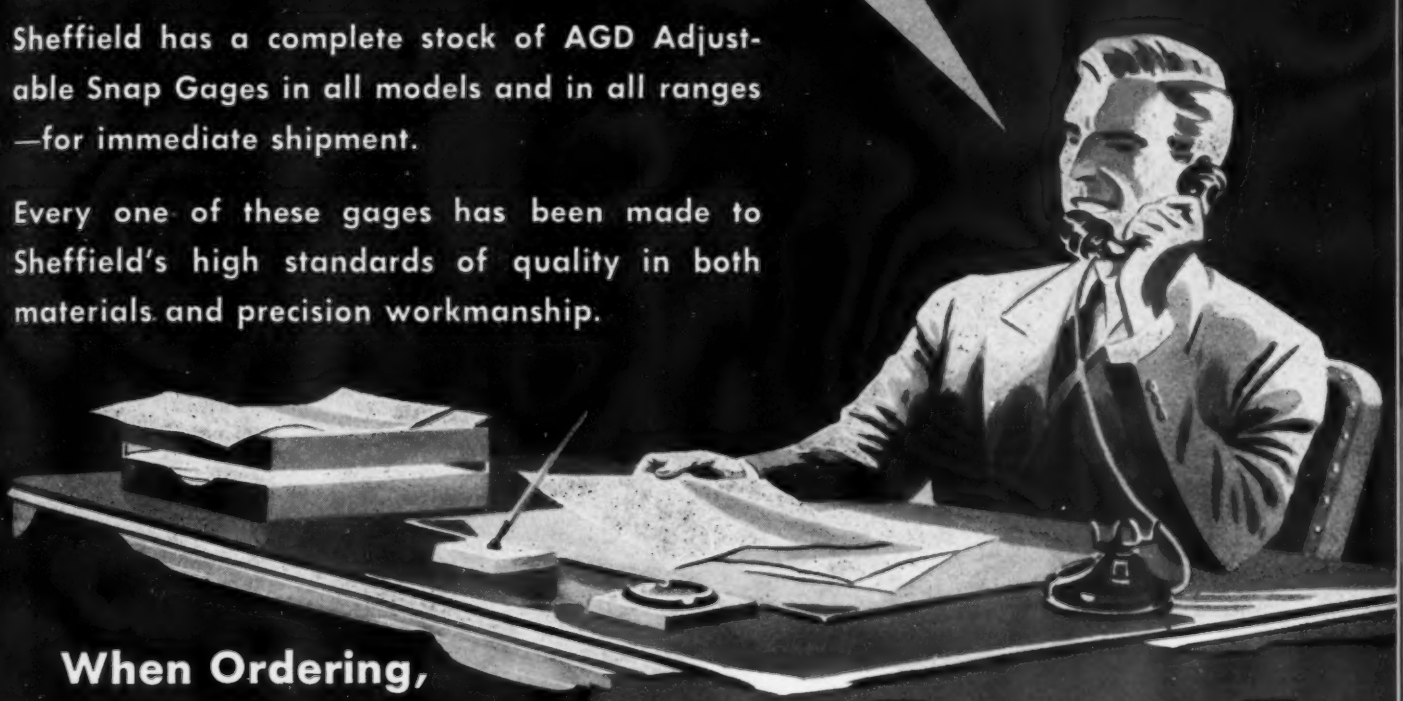
The difficulty was overcome by press fitting a short steel collar, or bushing, 0.0005 in. smaller than the work, onto the reamer pilot and adjacent to the cutting edges. No attempt is now made to engage the main bore of the cylinder head with the fixture pilot. The tool, driven by a floating chuck, is fed into the work, and the steel collar on the reamer pilot enters the bronze bushing to guide the cutter. Entrance of the reamer pilot into the fixture bushing now merely serves to steady the piece. Tool breakage is no longer a problem, and output is several times as rapid as the original set-up.

SNAP GAGES?

We Can Ship Today!

Sheffield has a complete stock of AGD Adjustable Snap Gages in all models and in all ranges —for immediate shipment.

Every one of these gages has been made to Sheffield's high standards of quality in both materials and precision workmanship.



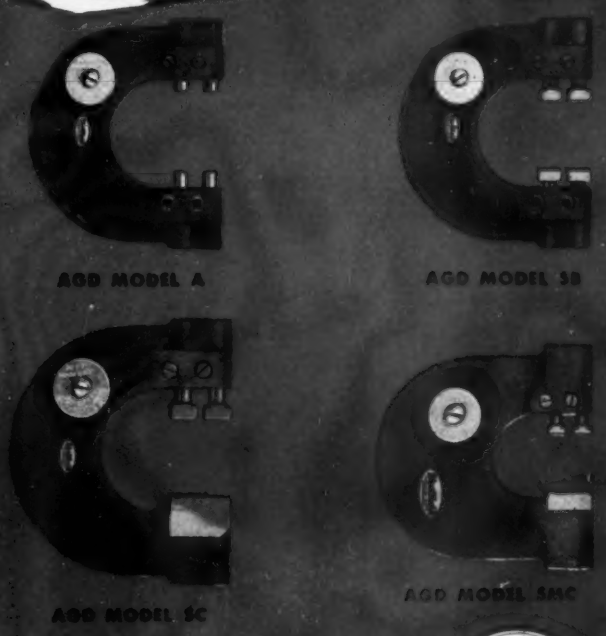
When Ordering, Be Sure to Give All the Following Information:

State Frame Model and Frame Size. Stipulate whether gage is to be set and sealed (allow additional day on orders for set and sealed gages). Give complete marking instructions if set and sealed.

FOR SPECIFICATIONS

SEE SHEFFIELD HANDBOOK No. 42-2

PAGES 150-153



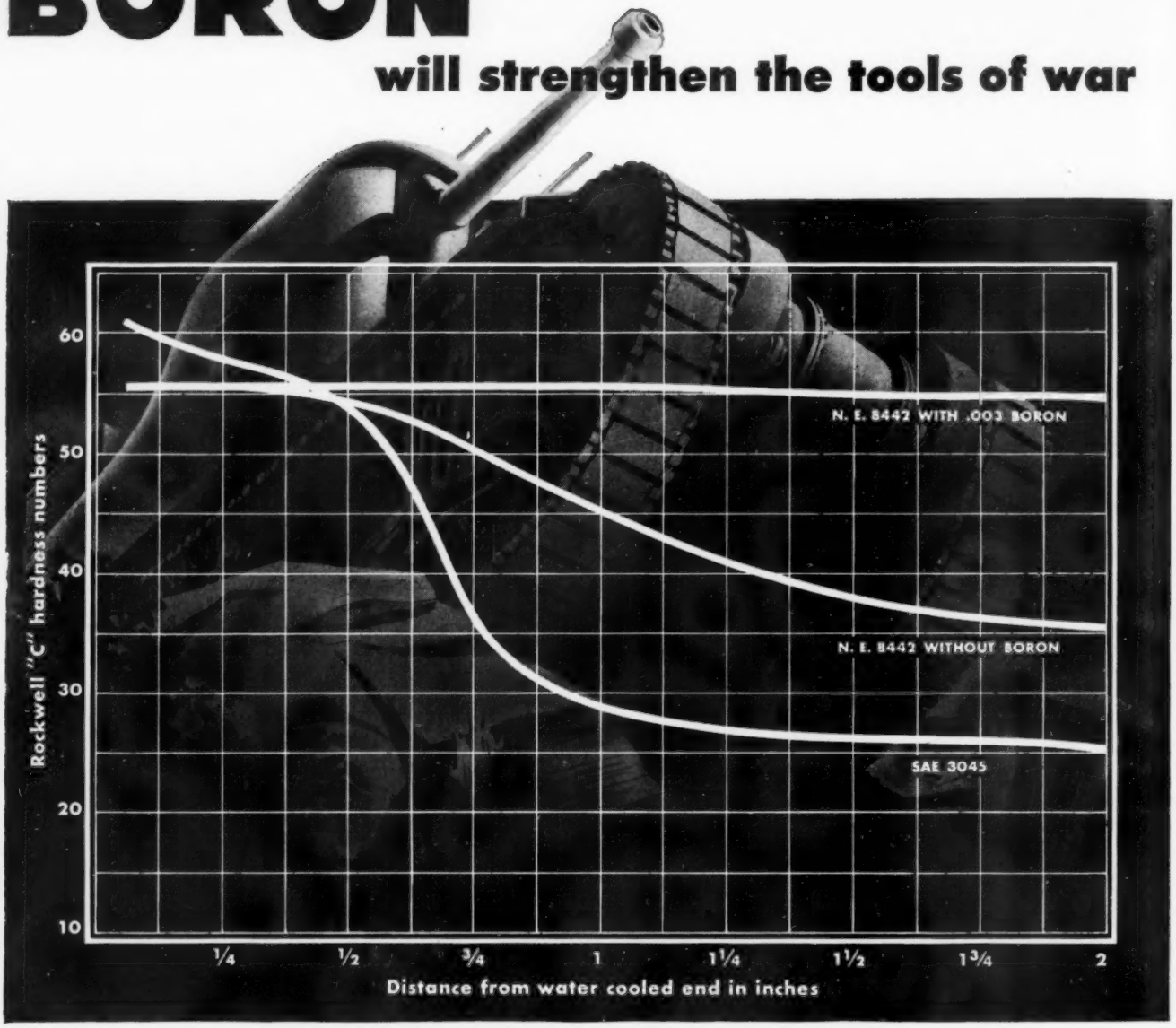
THE SHEFFIELD CORPORATION

DAYTON, OHIO, U. S. A.

SHEFFIELD GAGES

BORON

will strengthen the tools of war

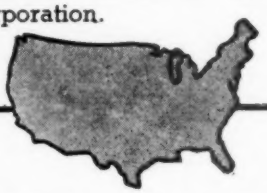


JOMINY HARDENABILITY TESTS ON STEELS WITH AND WITHOUT BORON

Boron is used to enhance the properties of armament steels, in rapidly increasing volume.

By far the most economical form in which Boron as an alloying element can be incorporated in ferrous metals, is a new ferro-boron developed through extensive research by the Molybdenum Corporation of America. Thousands of tons of boron-treated steel have been turned out by leading steel manufacturers, who confirm the laboratory reports of uniform distribution and high recovery. These results are obtained by regular open-hearth practice. Very definitely, therefore, the method makes it possible, by proper use of Boron, to cut down the requirement of scarcer materials, and still to meet exacting specifications.

On the availability and uses of Boron, Tungsten, or Molybdenum, correspondence is invited by the Molybdenum Corporation.



AMERICAN Production, American Distribution, American Control—Completely Integrated.
Offices: Pittsburgh, New York, Chicago, Detroit, Los Angeles, San Francisco, Seattle.
Sales Representatives: Edgar L. Fink, Detroit; H. C. Donaldson & Co., Los Angeles, San Francisco, Seattle.

MOLYBDENUM CORPORATION OF AMERICA
GRANT BUILDING PITTSBURGH, PA.

MCA

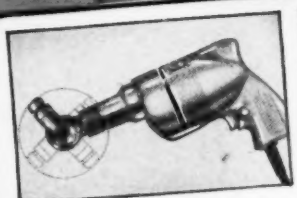
HERE'S AMERICA'S NEWEST WEAPON IN THE BATTLE OF PRODUCTION!

NEW!

MODEL "47" SKILDRILL

HEAVY DUTY ¼ IN. DRILL FOR "ROUND-THE-CLOCK" PRODUCTION!

$36



KETT UNIVERSAL APPLIANCE—You should have this unique appliance that extends the utility of SKILDRILLS . . . speeds up all tight-spot drilling in airplane wings, fuselages, etc. Swivels through 360° of angles in any plane. Light, easy to use. ¼ in. cap. chuck.

FLEXIBLE SHAFT—You need this accessory for fast, easy drilling in inaccessible spots. Drills at any angle. With SKILDRILLS in belt holsters, operator handles light shaft only; ideal for women workers. ¼ in. cap. chuck. Used with or without KETT UNIVERSAL.

Here is just the tool you need for fastest, most accurate ¼ in. drilling in constant 3-shift production. Like the famous Model "45" SKILDRILL (thousands now in use!) it's small, compact, light for easiest handling; but it has *even greater power* for your toughest jobs . . . *greater drilling speed under load* for more output per man!

Both in construction and design New Model "47" SKILDRILL has every feature you need. Compact die-cast body, helical-cut gears and 100% anti-friction bearing construction assure smoother, easier operation. Extra-Powerful Universal Motor provides peak drilling speed up to ¼ in. in steel, ½ in. in wood. Available in 4 speeds (1800, 2500, 3500 and 5000 R.P.M.) to fit every drilling need. Weighs only 3½ lbs.; only 7¼ in. long and 2 9/16 in. wide. Ask your distributor for a demonstration—once you see this tool in action you'll see why you need it now to boost production!

SKILSAW, INC., 5059 Elston Ave., Chicago

New York • Boston • Buffalo • Philadelphia • Cleveland • Detroit • Indianapolis • St. Louis • Kansas City
Atlanta • New Orleans • Dallas • Los Angeles • Oakland • Portland • Seattle • Toronto, Canada

HERE'S THE FAMOUS MODEL "45" SKILDRILL

The *preferred* drill in every field for easy handling and fast precision production drilling. Thousands in use even by women doing day-long drilling on assembly lines. Plenty of power and speed to keep pace with today's stepped-up schedules. $32.50

SKILSAW PORTABLE ELECTRIC TOOLS

★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★

LET'S WIN THIS BATTLE, TOO!

"***Hand tools are taking a terrific beating*** in the war factories. WPB estimates that because of improper use, the life of 75% of such implements is greatly reduced. Wear and tear appears to be greater on second and third shifts made up of less experienced workers."

—NEWSWEEK

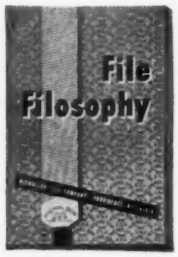
AMERICA! . . . Where ships are built in a fortnight! Where planes, guns and machines are produced by the thousands! Where manufacturing efficiencies are the wonder of the industrial world!

It is not at all like the American way to permit wastes like those reported in NEWSWEEK. Even under the stress of war production, tool misuse and abuse can be greatly lessened—*through education.* The millions of filing operations which take place daily in factories, machine shops and other industrial plants represent a wide field for teaching, training and savings.

Toward aiding manpower—conserving materials—making files do more work and last longer—

THIS NEW BOOK WILL HELP

"File Filosophy," by Nicholson, is recently off the press. Send for it. It's FREE —48 instructive, profusely illustrated pages on files—their *many kinds, correct use, proper care* and how to select *The right file for the job.* "File Filosophy" will prove helpful to both men and managements. Enables production heads and foremen to pass valuable information along to workers eager to learn and ready to do their part in the war we *must* win.

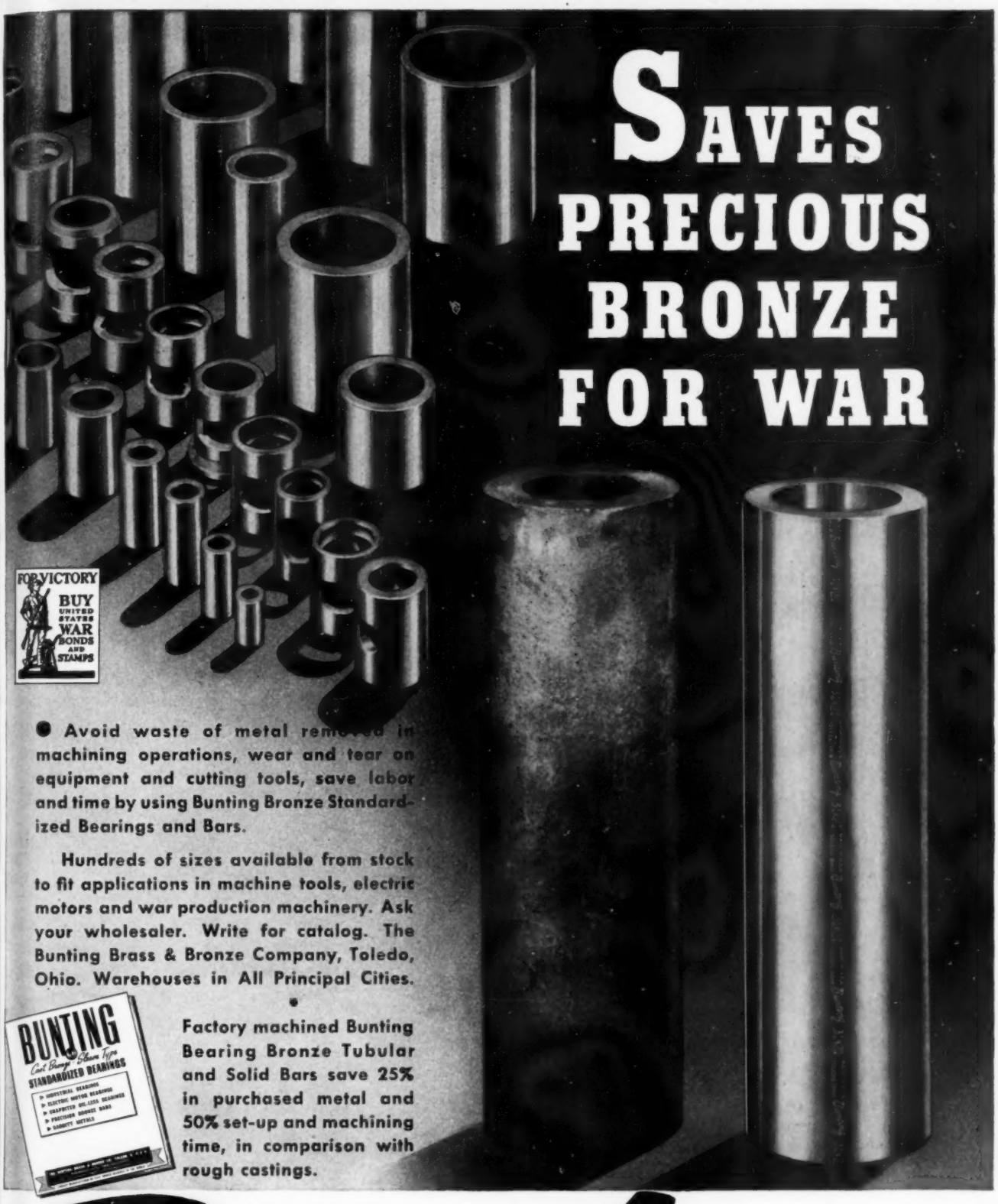


NICHOLSON FILE CO.
29 Acorn Street
PROVIDENCE, R. I., U. S. A.
(Also Canadian Plant, Port Hope, Ont.)

NICHOLSON U.S.A. MADE IN U. S. A.

NICHOLSON FILES

FOR EVERY PURPOSE



SAVES PRECIOUS BRONZE FOR WAR

FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

● Avoid waste of metal removed in machining operations, wear and tear on equipment and cutting tools, save labor and time by using Bunting Bronze Standardized Bearings and Bars.

Hundreds of sizes available from stock to fit applications in machine tools, electric motors and war production machinery. Ask your wholesaler. Write for catalog. The Bunting Brass & Bronze Company, Toledo, Ohio. Warehouses in All Principal Cities.

●

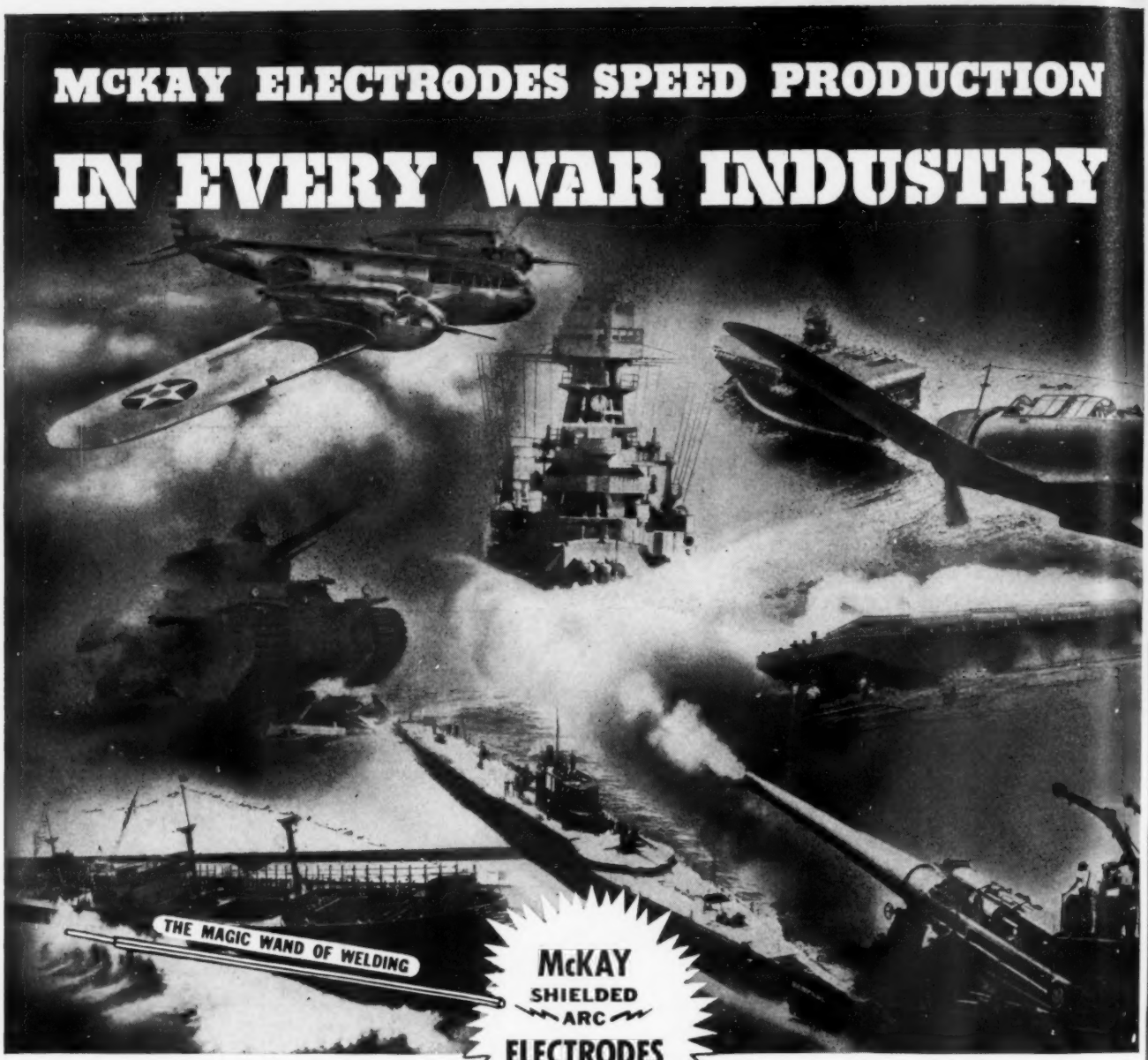
Factory machined Bunting Bearing Bronze Tubular and Solid Bars save 25% in purchased metal and 50% set-up and machining time, in comparison with rough castings.

BUNTING Cast Bronze Sleeve Type STANDARDIZED BEARINGS

Bunting

BRONZE BUSHINGS • BEARINGS • PRECISION BRONZE BARS

McKAY ELECTRODES SPEED PRODUCTION IN EVERY WAR INDUSTRY



War and *necessity* are one . . . and necessity is the "mother of invention."

When war demanded new conceptions of production, *revolutionary applications of welding* were "invented" to meet the need.

In no small measure McKAY Shielded-Arc Electrodes contribute to the total accomplishment.

For it is only natural that a manufacturing policy, which merited the title "the researched line," should likewise rise to meet the requirements of this emergency. Thus new analyses, new coatings, new sizes, new ranges of adaptability . . . plus ever growing volume . . . have caused McKAY Electrodes to help speed production in every type of war industry.

THE McKAY COMPANY · PITTSBURGH, PA.

PACIFIC COAST SALES OFFICES: 125 S. Santa Fe Ave., Los Angeles · 100 Howard St., San Francisco

The McKay line includes regular carbon steel, stainless, and alloy steel electrodes for every welding purpose. Literature on request.

Among the first honored with the Navy "E", The McKay Company is proud of the broader award of the Army-Navy "E".

McKAY WELDING ELECTRODES

AND INDUSTRIAL, MARINE AND AUTOMOTIVE CHAINS

"KEEP ON BUYING U. S. WAR BONDS"

Eight-spindle Cincinnati Cincinnomatic, tooled for machining high explosive shells. Amazing increases in tool-life are being reported as a result of using *Texaco Transultex Cutting Oil BB.*

Output Quadrupled between tool grinds . . .

THEY PREFER TEXACO

★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

★ More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.

★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.

★ More locomotives and railroad cars in the U. S. are lubricated with Texaco than with any other brand.

WHEN MACHINING 37-mm high-explosive projectiles, involving drills, reamers, taps and form-tools, 50 to 150 pieces was top output between tool grinds.

Then the cutting coolant was changed, and output not only was quadrupled, but feeds were also increased. The cutting coolant that permitted this tremendous increase is *Texaco Transultex Cutting Oil BB.*

Texaco Transultex is transparent, permits operator to *see* what's going on, it permits freer cutting, carries away more heat, produces better finish.

The outstanding performance that has made Texaco preferred in the fields listed in the panel has made it preferred by prominent users in the metal-cutting field.

Texaco users enjoy many benefits that can also be yours. A Texaco Engineer specializing in cutting coolants will gladly cooperate in the selection of the most suitable products for your operations. Just phone the nearest of more than 2300 Texaco distributing points in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York, N. Y.

TUNE IN FRED ALLEN EVERY SUNDAY NIGHT—CBS ★ HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY

TEXACO REG. T. M.

TEXACO Cutting and Soluble Oils
FOR FASTER MACHINING

QUESTION No. 1

Which INCO Nickel Alloy is FREE-MACHINING?

QUESTION No. 2

Which is free-machining and also HARDENABLE by HEAT TREATMENT?

Consult the tables below for comparative properties of these two metals

Answer No. 1 . . .

TOUGH YET EASY TO MACHINE

Engineers and screw machine products manufacturers already know this metal. Introduced several years ago, "R" Monel offers the corrosion-resistance, toughness and strength of regular Monel, plus improved machining characteristics.

Readily fabricated by cold forming, "R" Monel is available as hot-rolled and cold-drawn rounds, squares and hexagons. This INCO Nickel Alloy is well suited for automatic production of rust proof screw machine parts, yet has mechanical properties at least equal to steel screw stock (SAE 1112), and is actually *tougher.*

PROPERTIES OF "R" MONEL

Condition	Tensile Strength 1000 psi	Yield Strength (0.2% offset) 1000 psi	Elongation in 2 in. per cent	Hardness BHN 10-mm. ball 3000 kg.
Cold-drawn, annealed	70- 85	25- 40	50-35	110-140
Cold-drawn, as-drawn	80-115	50-100	35-15	150-230
Hot-rolled, annealed	70- 85	25- 40	50-35	110-140
Hot-rolled, as rolled	75- 90	35- 60	45-25	130-170
PROPERTIES OF SAE 1112 STEEL SCREW STOCK				
Cold-drawn, as-drawn	80-100	70-80	20-10	170-202
Hot-rolled, as rolled	60- 80	35-55	40-30	126-150

Answer No. 2 . . .

OFFERS EXTRA HARDNESS AND STRENGTH

This metal is the latest addition to the family of INCO Nickel Alloys. Its name . . ."KR" Monel. Like "R" Monel, "KR" Monel combines corrosion resistance and strength with improved machining.

But "KR" offers a big plus . . . *through heat treatment this unusual metal develops exceptional hardness and strength.*

A non-magnetic alloy, "KR" Monel is suitable for production of corrosion-resisting parts, and can be heat-treated after machining.

For complete information on these and other INCO Nickel Alloys, write to:

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York, N. Y.

PROPERTIES OF "KR" MONEL

Condition	Tensile Strength 1000 psi	Yield Strength (0.2% offset) 1000 psi	Elongation in 2 in. per cent	Hardness BHN 10-mm. ball 3000 kg.
Cold-drawn, as-drawn	100-125	70-100	35-15	175-250
Cold-drawn, heat-treated	140-170	100-130	30-15	260-320
Hot-rolled, as rolled	90-120	40- 85	45-30	140-225
Hot-rolled, heat-treated	135-160	90-120	30-20	260-300

★ ★ ★ ★ ★

INCO NICKEL ALLOYS

★ ★ ★ ★ ★

MONEL • "K" MONEL • "S" MONEL • "R" MONEL • "KR" MONEL • INCONEL • "Z" NICKEL • NICKEL

Sheet . . . Strip . . . Rod . . . Tubing . . . Wire . . . Castings

Gulf Super-Quench smashes a bottleneck—

plant ups submachine gun production 100%!

Another example of the greater quenching power of this revolutionary new quenching oil.

Heat treatment of the bolt was the bottleneck in submachine gun manufacture in a large ordnance plant until Gulf Super-Quench was used to quench this part.

To obtain the required surface hardness of Rockwell C-52, it was formerly necessary to carburize the bolt. With Gulf Super-Quench, this hardness is obtained without carburizing, which means a 50% reduction in heat treating time.

In addition, Gulf Super-Quench hardens the bolt through its entire cross section. *Result: bolts of better quality, a 100% increase in production of submachine guns in this plant!*

In plant after plant, this revolutionary new quenching oil is achieving remarkable results. Many parts for the weapons of our armed forces are being made harder and tougher with Gulf Super-Quench than was ever before possible with oil quenching. And yet Gulf Super-Quench has the same minimum tendency towards distortion and cracking that is characteristic only of mineral, fish, and fatty oil quenching media.

Here's the important reason why Gulf Super-Quench is a superior quenching oil: It has *dual action*—a faster cooling rate through the hardening temperature range, and the slow speed of conventional quenching oil below the hardening temperature range.

Gulf engineers are at your service in 30 states from Maine to New Mexico to consult with you on your quenching problems.

Mail This Coupon Today

Gulf Oil Corporation — Gulf Refining Company AM
3800 Gulf Building, Pittsburgh, Pa.

Without obligation, please have a Gulf Service Engineer call to consult with us on our quenching problems.

Name_____

Company _____

Title _____

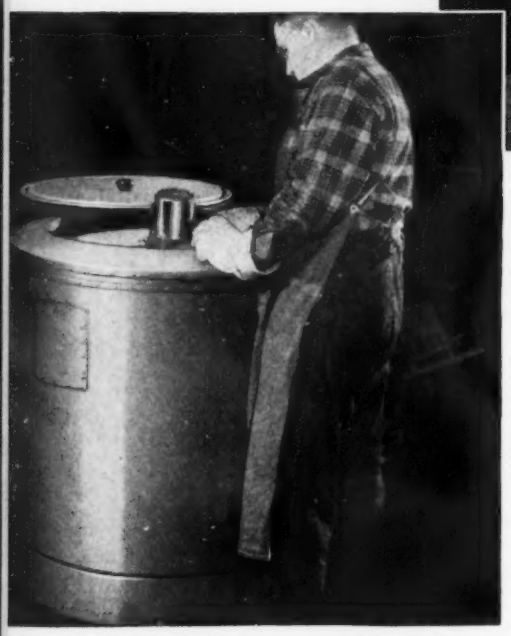
Address _____

FOR VICTORY
BUY
UNITED STATES
WAR BONDS
AND STAMPS

GULF INDUSTRIAL LUBRICATION

NOW a faster, better way to get shrink-fit assemblies

(Above) Operator merely slips chilled plug into heated strut for a permanent shrink-fit assembly



Deepfreeze Cascade Unit (−120° F.) used in shrinking plug for landing strut.

DATA AND PART INFORMATION

Shrink-fit assembly of steel plug in airplane landing strut.

Diameter of Plug.....	3.880″ / 3.879″
Diameter of Bore.....	3.875″ / 3.874″
Shrink of Plug..	.0026″ @ −120° F.
Expansion of Bore.....	.0050″ @ +450° F.

FORMER DIFFICULTIES

Heating by torches did not impart uniform temperatures. Heating in oil bath alone did not produce sufficient expansion for assembly.

SOLUTION

The Deepfreeze Cascade −120° F. used on plug plus heating of bore results in permanent shrink-fit assembly, speeds operation.

Deepfreeze METAL CHILLING SPEEDS ASSEMBLY OF LANDING STRUTS . . . ELIMINATES "FATIGUE" STRAINS

This is another excellent example of how intense cold (−120° F.) in conjunction with normal heating (+450° F.) has increased the production and improved the manufacture of airplane landing struts.

Formerly the female part of the assembly was heated with torches. This was unsatisfactory, because the torches did not impart a uniform heat nor was the heat intense enough for sufficient expansion. In addition, it was necessary to assemble the units with an arbor press which produced scratches in the mating surfaces... *dangerous future* fatigue and breaking points.

"Production Time Cut in Half"...Completes Operation in 10 Minutes

The barrel of the DEEPFREEZE Cascade Unit is filled with a non-inflammable solvent which does not freeze at −120° F. The plug is immersed in the liquid, while the female part is subjected to an oil bath of 450° F. and expanded .005″. The plug is shrunk .0026″, making it simple for the operator to insert the plug by hand. Total time for the entire operation is approximately 10 minutes.

The Uses of Deepfreeze in YOUR Plant

Deepfreeze sub-zero temperatures (as low as −120° F.) can help you in the following metal working operations.

1—Shrinking of metal for ease of bearing assembly, etc.

2—Testing of metals for reaction of sub-zero temperatures to aircraft instruments, etc.

3—Treating of metals for prevention of growth or warp in gauges, etc.

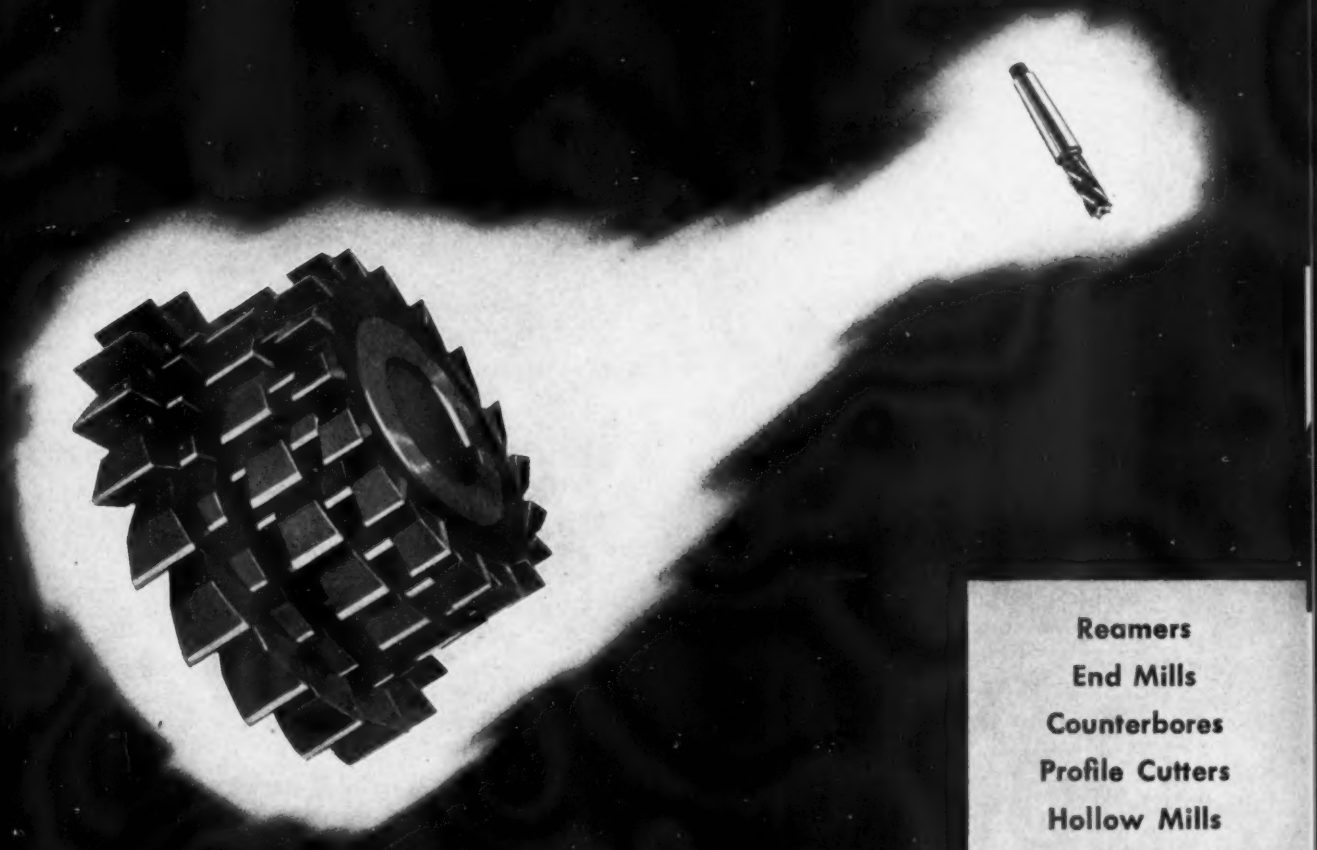
FREE ADDITIONAL DATA and proof of the outstanding success of the Deepfreeze method for chilling metals are included in this booklet. Write for *your* copy today.

Deepfreeze
DIVISION

MOTOR PRODUCTS CORPORATION
2327 DAVIS ST., NORTH CHICAGO, ILLINOIS

"SPECIALS" On Time

SPECIAL PRECISION CUTTERS OF HIGH-SPEED STEEL
for
AIRCRAFT — GUN — WAR INDUSTRIES



To meet the demands of the war program — ON TIME — C & W is constantly expanding plant capacity. C & W is one of the largest producers of special high-speed precision cutting tools — and has an outstanding record in meeting promised delivery schedules.

Write for illustrated pamphlet — Consult us on your tool requirements

Reamers
End Mills
Counterbores
Profile Cutters
Hollow Mills
Shaving Tools
Interlocking Cutters
Tapered Reamers
Gun Drills
Countersinks
Milling Cutters

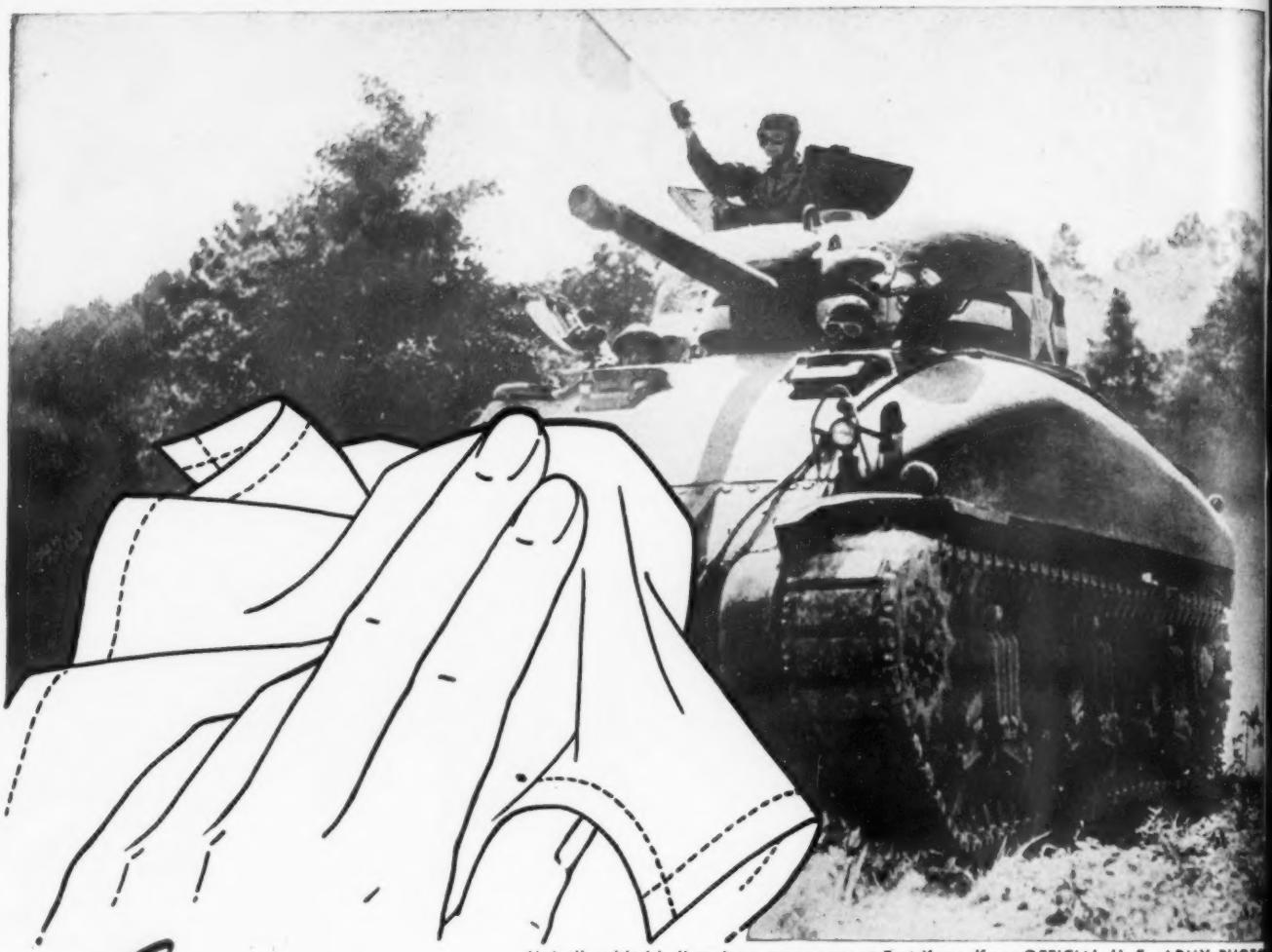
C & W TOOL COMPANY

19 Chestnut Street, Cambridge, Massachusetts

NEW YORK PHILADELPHIA DETROIT

C&W TOOLS

FOR OVER 30 YEARS — QUALITY PRECISION CUTTING TOOLS



M-4 all-welded hull tank on maneuvers at Fort Knox, Ky.—OFFICIAL U. S. ARMY PHOTO

Somewhere There's A Tank That Had Its Nose Wiped!

BEFORE the amazingly strong all-welded hull of the M-4 tank goes to the arsenal for final assembly, a primer coat of paint must completely and uniformly cover it, both outside and inside. For the paint to do this and to stay on, the metal surfaces must be completely free of all grease, shop dirt and welding scale.

Anticipating this necessity, the hull manufacturer called in an Oakite Technical Service Representative. Examining the substances to be removed, he recommended a specialized Oakite material to be applied with the time-saving Oakite Solution-Lifting Steam Gun. Then he demonstrated.

As he stepped back from the cleaned, dried hull, spectator executives took white cloths and proceeded to give it a "handkerchief test". Wiping, wiping, wiping, they sought a trace of dirt. Found none!

That initial demonstration cleaning job took 90 minutes. The second hull off the line was as thoroughly cleaned in 22 minutes! Since then, the operation has been so streamlined that cleaning, plugging threaded openings and primer-coat painting takes just *one hour per unit.*

Somewhere today . . . among the untold numbers of its kind on far-flung fighting fronts . . . this first tank-that-had-its-nose-wiped is most likely doing its own peculiar kind of "wiping up".

For makers of armament . . . from battleships to small-pea size primers for machine gun cartridges . . . Oakite materials and methods have made difficult cleaning operations astonishingly FAST and satisfyingly THOROUGH. Oakite War-Time Technical Service is FREE, entails absolutely NO OBLIGATION. Your inquiry will be welcome and given our immediate attention.

Manufactured only by

OAKITE PRODUCTS, INC., 24 Thames Street, NEW YORK, N. Y.

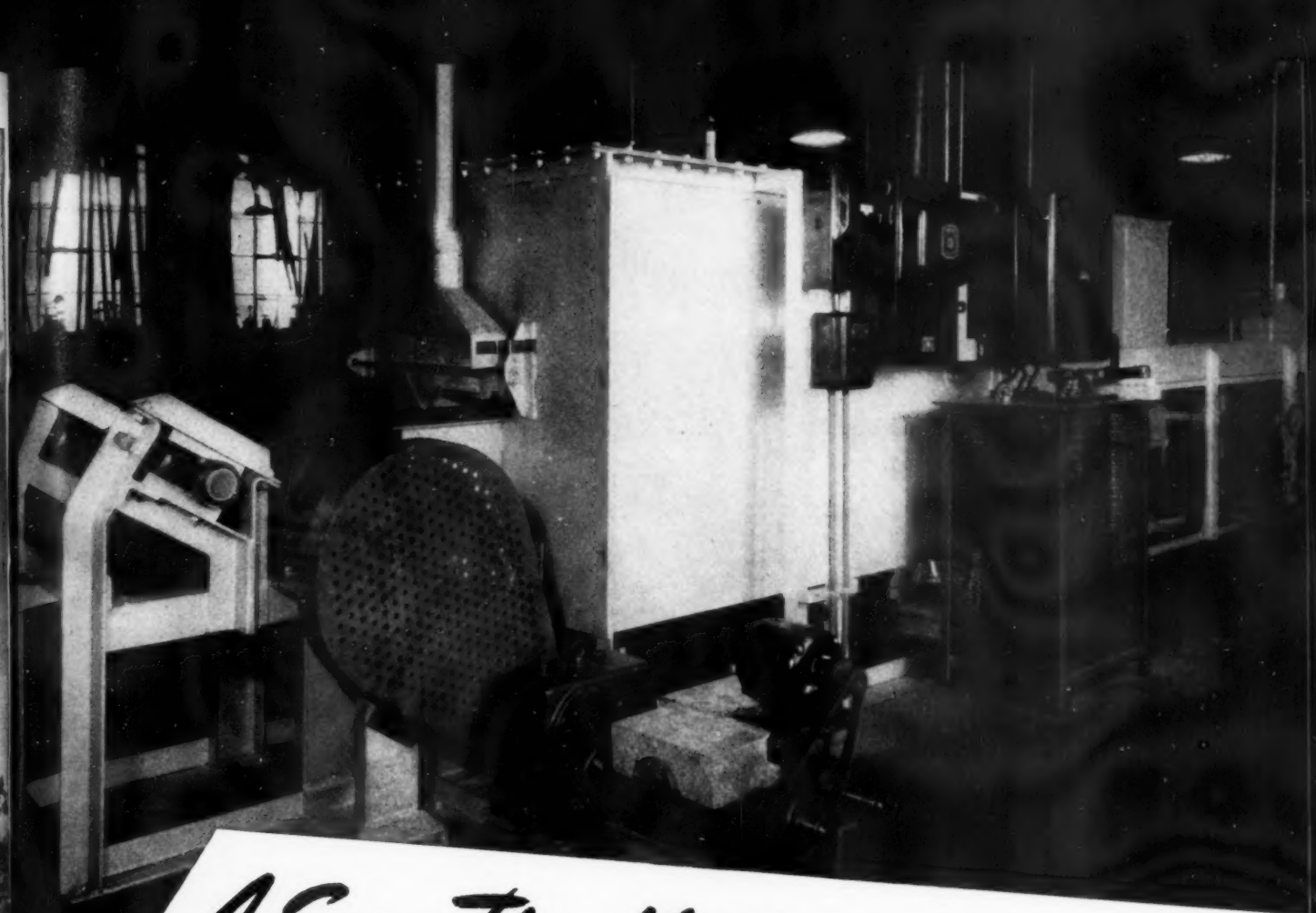
Technical Service Representatives in All Principal Cities of the United States and Canada

OAKITE

MATERIALS...METHODS...SERVICE

CLEANING

FOR EVERY CLEANING REQUIREMENT



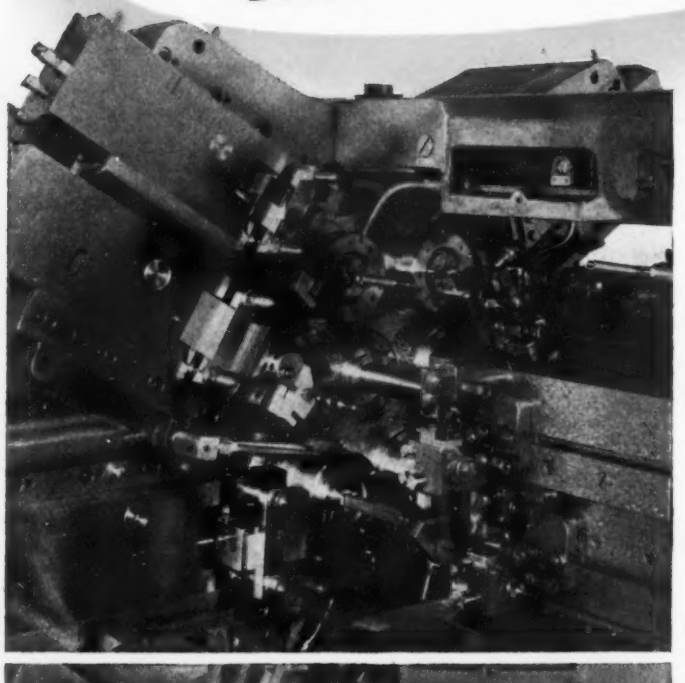
A Sure-Fire Method of Brazing AT MAXIMUM SPEED

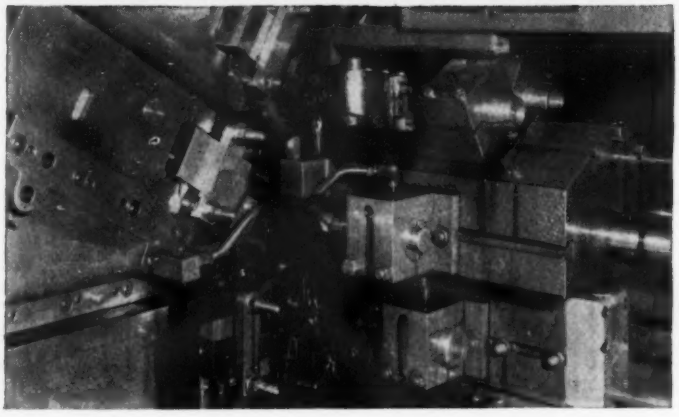
SALEM ENGINEERING COMPANY

THE SALEM furnace, pictured above, brazes 300 pounds of small size gun components per hour. These gun parts travel through heating and cooling chambers of the furnace on a continuous 12" wide alloy steel mesh belt. Ribbon type electric heating elements, operating at 40KW, provide the heat at 2000° F. and a special Salem Seco gas generator permits at all times accurate control of atmosphere in the heating chamber. Cooling is provided by a water jacketed chamber. As with all Salem equipment, it accurately meets the demands for long life, and dependable as well as high-speed production, synchronized into factory operations. Whatever may be your heat treating problem, benefit by the broad experience Salem engineers have had in this country, Canada and Europe. Give them your problem now. Write today.

SALEM ENGINEERING CO. • SALEM, OHIO

THIS WIDE-OPEN TOOLING AREA ON THE GREENLEE MAKES MY JOB EASIER AND FASTER!





BUILT-IN COOLANT SYSTEM distributes the coolant through the tool and cross slides direct to the various cutting tools. The above photograph of a typical set-up on the Greenlee shows the coolant outlets in each tool holder and the easy-to-use, short nozzles.

JUST ONE OF THE REASONS OPERATORS PREFER GREENLEE SCREW MACHINES

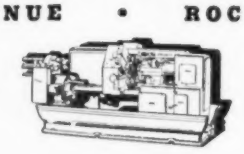
Ask the man who knows . . . the operator right out on the machine . . . and he'll tell you that the Greenlee Multiple-Spindle Screw Machine is one of the easiest machines to set up and to operate that he has ever worked on. He'll tell you that the wide-open tooling area of the Greenlee makes his work so much easier and faster because he has plenty of elbow room in making adjustments and changes. He'll also tell you that the built-in coolant system with an outlet in each tool holder permits the use of convenient, easy-to-use short nozzles to bring the coolant to each cutting tool. He'll mention how the low, compact design of the Greenlee reduces physical strain and eliminates the necessity of standing on the pan or boxes to install tooling to upper positions, and also how the positioning of the cross slides makes it easy for him to observe all cross-slide tools in action. And what's more important he'll tell you that these design features, permitting easier set-up and operation, enable him to obtain maximum efficiency and to turn out more work in a day with less fatigue.

Free Help For Your Operators

Enlarged copies of three recent Greenlee advertisements giving many valuable suggestions and production short cuts are available, without charge, for distribution to your operators. Write today for copies of (1) *14 Practical Suggestions For the Inexperienced Screw Machine Operator;* (2) *Correct Application of Cutting Fluid To Insure Longer Tool Life;* (3) *Suggestions For Changing and Adjusting Collets On Greenlee Screw Machines.*

GREENLEE BROS. & CO.

1726 MASON AVENUE • ROCKFORD, ILLINOIS

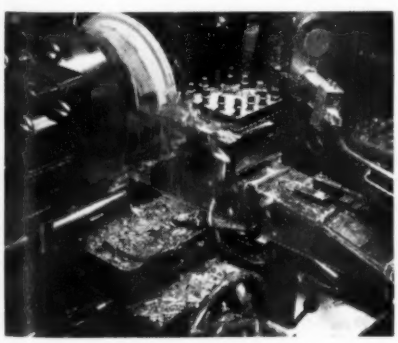
ASK THE OPERATOR  ***WHO RUNS ONE . . .***

★ **Neglecting machine tool lubrication is a sure-fire way to get more scrap. Double-check your lubricating practice now. It will pay dividends in many ways.**

• WHAT oil should be used in hydraulic systems? How often should oil be changed in gear heads? How can you be sure lubricating schedules are strictly followed? Dozens of questions like these make up the problem of machine tool lubrication. Whether you get the right or wrong answers means the difference between full, useful machine tool life, and breakdowns and scrapped tools.

Periodic checking of the lubricants, application, and lubricating schedules is the only way to be sure you're safe. Longer hours of operation require more frequent lubrication and oil changes. New machines may require lubricants not previously used in your plant.

Questions like these can be answered quickly and fully by a Standard Lubrication Engineer. These Engineers are available to all plants producing war materials in the Middle West. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Ill., for the Engineer nearest you. In Nebraska, write Standard Oil Company of Nebraska at Omaha.



Dirt, chips and water contaminate lubricants, and necessitate regular machine tool lubrication. On machine at left, ways and guides are amply protected from abrasive chips and cutting fluids. Ways, gears, and bearings are automatically lubricated by circulating systems. But all machine tools are not so modern. On those, the lubricants and lubricating schedules, and the help of a Standard Lubrication Engineer in determining them, become increasingly important.

What oil to use? A difficult question to answer for old or rebuilt machines. Wear changes lubricating requirements. Gear heads, for example, may need heavier oils to prevent leakage, or more stable oils to reduce deposits and gear case cleaning. Spindles and bearings may need dripless oils to prevent leakage.

On new equipment, it is frequently necessary to substitute multiple-duty oils in place of those recommended, to avoid stocking a confusing number of lubricants. These must be carefully selected. A Standard Lubrication Engineer's knowledge of lubricants and his experience in other plants enable him to select lubricants exactly fitted to your new equipment.

When to change oil? Each type of machine and its oil system require special consideration, but certain conditions, common to all, help determine when to change oil. For example: type of operation—continuous or intermittent, hours or number of shifts; quality of lubricant; contaminants; age and condition of equipment; efficiency of oil filters, if used; size of oil reservoir.

It's vitally important that the oil stay clean and free from deposits. That should be the first consideration in determining oil change periods—not only to prevent wear, but also to eliminate the time-consuming job of cleaning oil systems.

How to maintain lubricating schedules? With hand-lubricated equipment, there is danger from over-lubrication, as well as neglect. Both can be avoided by being doubly sure that new men, and men taking over equipment new to them, fully understand what lubricants are needed, where they go, and how often they should be applied. One method is to provide cards containing this information to be hung on or near each machine. This eliminates the possibility that operators will forget or misunderstand instructions. A Standard Oil Engineer is familiar with the various methods in use in other plants. His suggestions may help you in starting such a plan.

OIL IS AMMUNITION... USE IT WISELY

STANDARD OIL COMPANY (INDIANA)

LUBRICATION ENGINEERING • • LUBRICATION ENGINEERING • • LUBRICATION ENGINEERING • • LUBRICATIO

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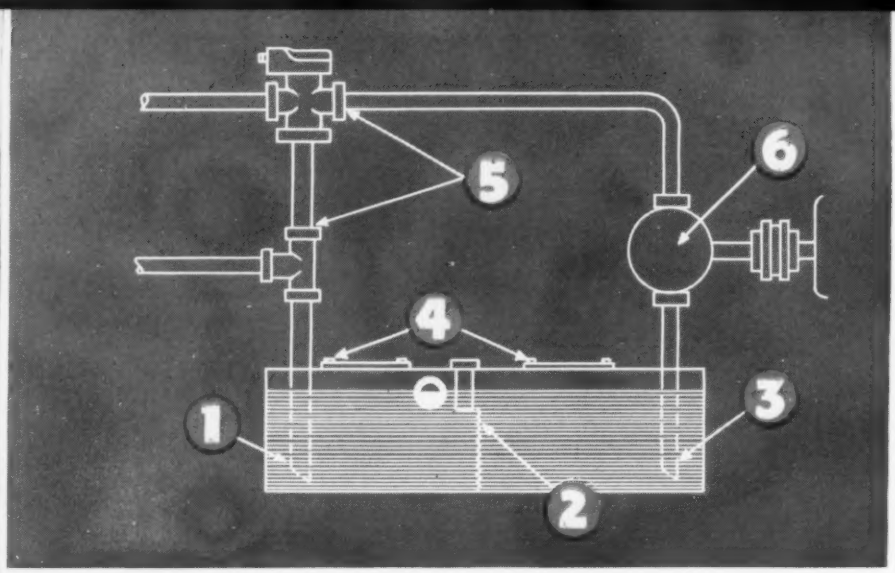


Hydraulic Oils and how to select them

Troubles in hydraulic system operation are not always caused by the oil used, but many of them can be avoided by using the right oil. Here are some suggestions for selecting the right hydraulic oil:

WHAT TO AVOID

Viscosity too high. Most easily detected when starting the unit, by sluggish operation and delayed circulation, which may damage the pump. When operating, too high a viscosity may cause over-heating and rapid oil oxidation. **Viscosity too low.** Indicated by low pressure, erratic operation. It frequently causes leakage at packings and glands. Excessive wear may develop because lubrication is inadequate.

Poor stability. Conditions under which hydraulic oils operate (heat—pressure—aeration) tend to cause the oil to oxidize and form deposits in the system. These deposits cause wear on pumps and valves, and erratic operation, which can only be corrected by an expensive cleaning operation. Deposits caused by oil oxidation should not be confused with those caused by contaminants entering the hydraulic system.

Poor demulsibility. Although normal precautions are taken to keep moisture and coolants from entering the hydraulic system, some oils will emulsify in the presence of even a small amount of moisture. The resultant frothy mixture is compressible, causing a loss of pressure and poor control of operation.

WHAT TO LOOK FOR

High Viscosity Index. Hydraulic pump and motor manufacturers have definite viscosity recommendations for oil used in their equipment. But for further protection, you need an oil of *high viscosity index*—an oil that resists changes in viscosity with changes in operating temperatures. Stanoil, for example, flows readily at starting, yet maintains suitable viscosity at the required operating temperatures.

High stability. There are many reasons why oils oxidize. Briefly, petroleum consists of various hydrocarbons, some of which unite readily with oxygen. This is called oxidation. The problem is to remove these unstable hydrocarbons. This has been accomplished in Stanoils by a unique refining process. Frequent cleaning of oil system, and oil changes necessary because of oil oxidation, are materially reduced with Stanoil.

Ease of separation from water. An oil must have good demulsibility—must separate readily from water so it will not form oil and water emulsion. Stanoil has this quality. With reasonable care to keep out dirt, Stanoil will not emulsify and can easily be separated from any water in the system.

These are just a few points to check in choosing a hydraulic oil. Let a Standard Lubrication Engineer help you pick the right grade and type of oil for your specific hydraulic jobs. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Illinois, for the Engineer nearest you.

Tips on a typical hydraulic system installation

1. **Oil return line** must discharge below oil level to prevent formation of air bubbles which would cause erratic operation of the pump.

2. **Baffle plate** installed between intake and return discharge helps settle out any dirt in the system and remove air bubbles introduced when filling.

3. **Oil intake pipe** should extend to within two diameters of the bottom of the reservoir, to reduce the possibility of air entering the system if the oil level is low.

4. **Hand holes** are recommended to facilitate inspection of oil and cleaning of oil reservoir, but they must be tightly sealed to prevent entrance of contaminants and water into the system.

5. **Pipe joints** should be made positively leakproof to prevent entrance of water or air and the loss of oil and pressure.

6. **Hydraulic pumps** are accurately machined units. Their continuous, efficient operation depends upon how this accuracy is maintained. The best installation can be a continual source of trouble unless a clean oil of high quality, high stability, and the right grade, is used.

Oil Is Ammunition . . . Use It Wisely

★ STANOIL ★

LUBRICATION ENGINEERING

STANDARD OIL COMPANY (INDIANA)

This advertisement is one of a series appearing regularly in national periodicals, farm publications, and prominent city newspapers. Reprints in full color are available for your use. Write us for them.

Reproduced from a full-color painting by Douglass Crockwell for Republic Steel.

"Now . . . if I was down there in Washington . . ."

That's Joe talking. Every night when he stops in for his coffee and sinkers he has plenty to tell the boys about how this war should be run. Maybe he's right and maybe he isn't.

The important thing is that he can say what he thinks—out loud. Right in front of Tom Burke, the cop. He couldn't do that in Germany or Japan or Italy . . . or in any of the nations that have been "liberated" by the New Order.

But Joe is an American.

★ ★ ★

And because Joe is an American, he has more privileges—*and more opportunities*—than can be found anywhere else in the world.

If he doesn't want to work for somebody else, he can operate a business of his own—anywhere. Joe is a free agent. His future is under his hat. Like millions of other Americans on the way up, Joe can cash in on a way of life that has brought America the highest standards of living in the world—by a big margin.

It is a typically *American* way of life—based on American ingenuity, ambition, desire to get ahead. It gives every person a chance.

That is why today, after a comparatively short time, teamwork and cooperation in American industry and American agriculture are performing miracles of production that would be impossible in a country weakened by years of regimentation and dictatorship.

That is why the steel industry—in which Republic holds a leading position—has been able to "come through" with the steels and steel products for our Nation's gigantic armament and shipbuilding programs. In 1942 Republic operated at 99.5% of capacity for the entire year. And the nearly 70,000 Republic men and women supporting our fighting forces* beat the 1941 record by 479,000 tons.

That, too, is why Republic chemists, metallurgists and engineers are constantly searching for—and finding—new and improved ways of making finer steels.

And that is why you can look with faith to the future—when victory will insure our *free* way of life—when you and we can return to the job we want to do most—produce peacetime products to make America a better, happier, safer place in which to live.

Until then, we have a big job to do. LET'S DO IT WELL and get it finished in a hurry. And let's guard faithfully our American way of life!

**Over 13,000 Republic men are now in uniform.*

REPUBLIC STEEL CORPORATION

General Offices: Cleveland, Ohio

Berger Manufacturing Division • Culvert Division
Niles Steel Products Division • Steel and Tubes Division
Union Drawn Steel Division • Truscon Steel Company
Export Department: Chrysler Building, New York, N.Y.

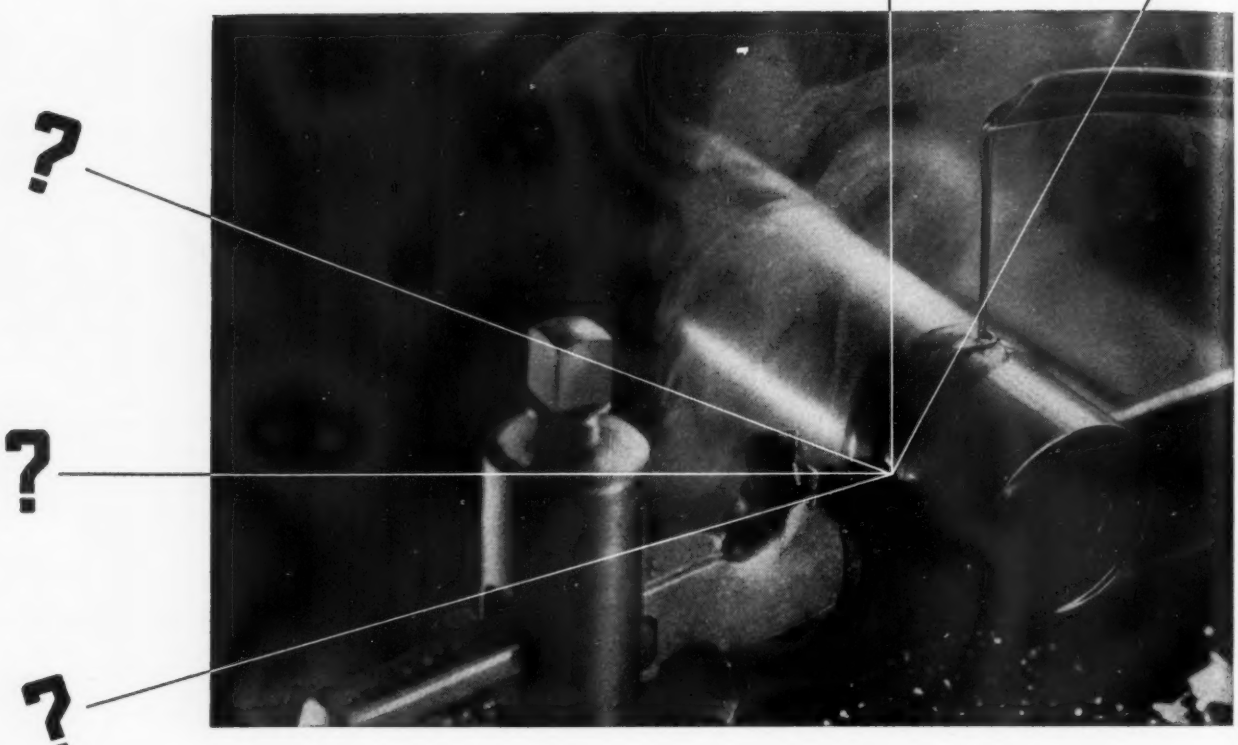
REPUBLIC STEEL — DEDICATION FOR VICTORY

Republic

ALLOY AND ENDURO STAINLESS STEELS

Sheets, Plates, Pipe, Hot Rolled and Cold Drawn Bars,
Upson Bolts—Nuts—Rivets, Electrunite Tubing.

WHAT FIVE THINGS ARE BEING CUT HERE?



An efficient cutting tool operation cuts more than metal. It also cuts friction, temperature, power expenditure and tool wear.

There is a close link between all these factors and the cutting fluids you use. Unless those fluids are exactly right for each job, the efficiency of the cutting is going to be much lower and the cost higher than it could be.

Why not let a Cities Service Lubrication Engineer check your operation? There's no cost nor obligation. And he'll give you expert advice on which of the precision-perfect Cities Service Cutting Oils will give you the best cutting performance at the least cost of each cutting operation.

Whether your work calls for one or many types of lubricants—Cities Service is ready to serve you with quality products and expert counsel.

Get in touch with your nearest Cities Service office today. Also, for a copy of the highly informative booklet on "Metal Cutting Lubrication" write to Cities Service Oil Company, Room 1327, Sixty Wall Tower, New York, N. Y.

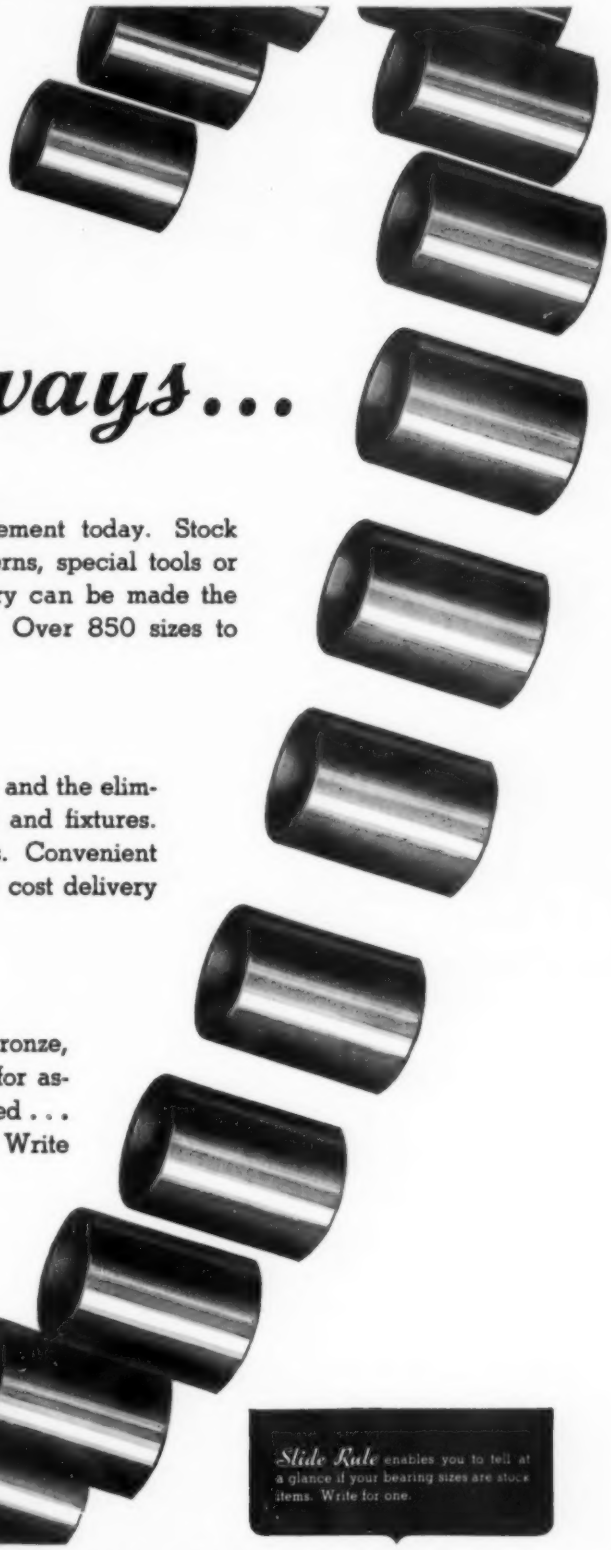
CITIES SERVICE OILS — ONCE-ALWAYS

CITIES SERVICE OIL COMPANY
NEW YORK · CHICAGO

IN THE SOUTH
ARKANSAS FUEL OIL COMPANY
SHREVEPORT, LA.

STANDARDIZE

with
JOHNSON
GENERAL
PURPOSE
Bronze
BEARINGS



save 3 ways...

TIME . . . a most important element today. Stock Sizes eliminate delays due to patterns, special tools or machinery. In most cases, delivery can be made the same day the order is received. Over 850 sizes to choose from.

MONEY . . . saved by a low unit cost and the elimination of charges for special tools, jigs and fixtures. This is particularly true of small quantities. Convenient location of warehouse stocks provides low cost delivery to your plant.

TROUBLE . . . avoided by high quality bronze, precision manufactured, machine finished ready for assembly. Long, satisfactory performance is assured . . . quick, easy replacement is available from stocks. Write today for a copy of our new catalogue.

NEW
Catalogue

Lists and describes the most complete stock bearing service available. Write for your free copy.

Slide Rule enables you to tell at a glance if your bearing sizes are stock items. Write for one.

JOHNSON BRONZE COMPANY

Sleeve BEARING HEADQUARTERS

515 SOUTH MILL STREET • NEW CASTLE, PA.

A *Complete* TOOL SERVICE

FOR TURNING, BORING AND FACING OPERATIONS

CARBIDE *TOOLS*

WITH TANTALUM TUNGSTEN

LEADING THE INDUSTRY IN CARBIDE TOOLS SINCE 1930

The inclusion of Tantalum Carbide in the manufacture of Ramet Cemented Carbide Tools is the reason for their superiority. Tantalum Carbide is an extremely hard material and it imparts to hard carbide compositions a self-lubricating action which minimizes cratering or chip wear.

RAMET STANDARD TOOLS

are complete tools, ready to use, in a choice of 10 styles, 3 grades, and many sizes—164 tools in all. Ramet Carbide Tipped Standard Tools meet a majority of requirements for machining steel, cast iron, and all other materials, and are readily adaptable to special jobs.

RAMET MILLED AND BRAZED TOOLS

have a Ramet Carbide Blank brazed in place. All grinding is done by customer. Any size or shape of shank or grade of blank is obtainable in this classification.

RAMET TOOLS TO ORDER

cover any style or shape of tool made to customer's order. Ramet Cemented Carbide Blanks are brazed in position and tool finished ground ready to use.

RAMET BLANKS

Cemented Carbide of any shape, grade, or style all obtainable for the customer to make his own tools. A large variety of sizes in two styles and any of the three general purpose grades are available as standard blanks.

FREE **Giant poster for display on your shop walls will show new machinists how to lengthen the useful life of your cemented carbide tools.**

Published as a service to the industry. A copy of this instructive poster will be sent upon request.

TANTUNG *TOOLS*

"THE MIRACLE METAL"

THE MOST IMPORTANT CONTRIBUTION TO METAL CUTTING SINCE THE ADVENT OF CARBIDE . . .

TANTUNG IS EFFECTIVE UP TO THE CARBIDE CUTTING RANGE • USE TANTUNG WHERE YOU CANNOT USE CARBIDE

Tantung is a hard, tough, non-ferrous alloy. Its red hardness is far above that of any steel. It is strong and tough and unlike other non-ferrous cutting alloys, Tantung contains TantalumCarbide.

TANTUNG ECONOMY TOOLS

consist of a generous Tantung bit securely brazed to a substantial steel shank. This construction economizes the use of valuable cutting alloy and adds strength and support. Furnished in square and rectangular tools.

TANTUNG ALL-PURPOSE TOOLS

are furnished with a blank of generous proportions, extending across the entire width of the tool. Blank is securely brazed to a substantial steel shank. Supplied in square and rectangular tools.

TANTUNG SOLID TOOL BITS

are furnished with front clearance and with the gate end notched for identification. Supplied in square and rectangular bits with a full range of sizes.

TANTUNG CUTTING OFF TOOLS

are available in both the rectangular flat and double bevel styles and both are furnished in six standard styles. These tools require grinding.

TANTUNG MILLING CUTTER BLADES

The high red hardness of Tantung Milling Cutter Blades permits high cutting speeds. Inherent strength permits interrupted cuts, heavy roughing cuts, or cuts thru scale and hard spots. The tantalum carbide content makes these blades efficient for milling tough, stringy steel with little or no chip wear.

SPECIAL TOOLS

Made to your specifications. Form tools, boring tools, shell end mills, solid end mills, etc.

4311

THERE IS A RAMET BRANCH Ramet *AS CLOSE AS YOUR TELEPHONE*

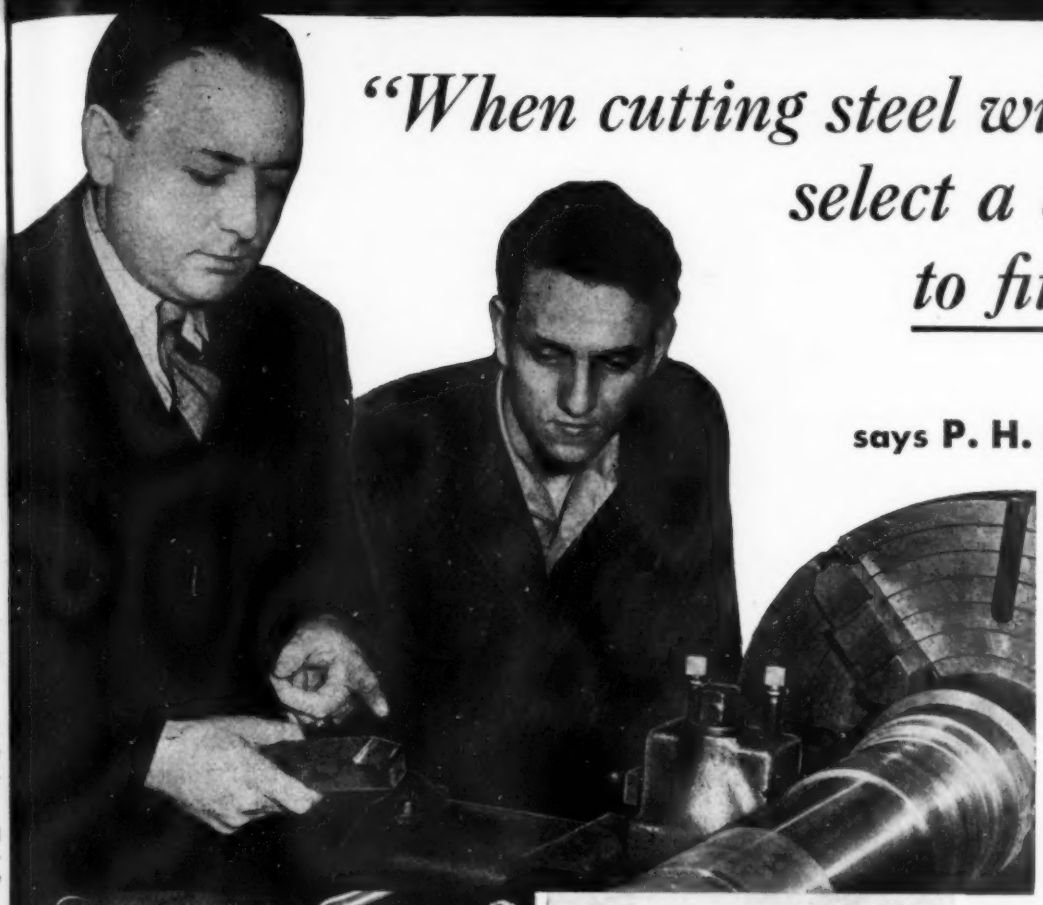
VASCOLOY-RAMET CORPORATION

NORTH CHICAGO, ILL. • DISTRICT SALES AND SERVICE IN PRINCIPAL CITIES

IN CANADA: CARBIDE TOOL AND DIE COMPANY, HAMILTON, ONTARIO

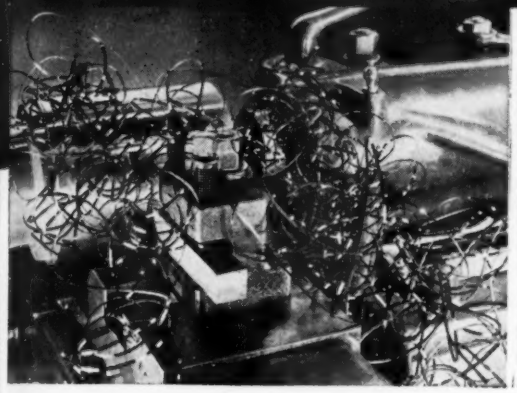
CUTTING TOOL TIPS FROM THE TOP-NOTCHERS—#2

"When cutting steel with carbides.. select a chip breaker to fit the job!"



says P. H. MILLER, Chief Enginee
Carboloy Company, Inc
Detroit, Michigan

BECAUSE OF its high tensile strengt steel normally produces a continu ous chip during machining opers tions. These chips are awkward t handle even at the slower cuttin speeds of high-speed steel tools an present a real problem in safe ec nomical disposal at the high speed common with cemented carbid tools. To get maximum result chips must be controlled by the us of a suitable chip breaker.



"THERE'S NO TIME for making 'hay' on steel cutting jobs today! Chips like these are a hazard to the operator, slow down production and often mar the finish of the work. They are easy to eliminate with the right type of chip breaker."

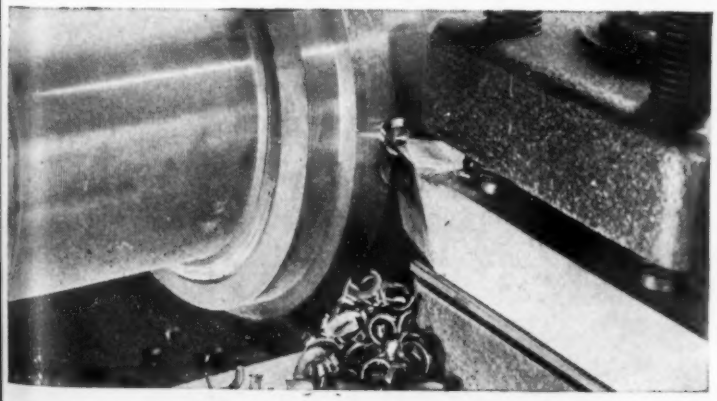
"THE GROUND-IN STEP CHIP BREAKER is the most widely used type. Recommended for practically all steel cutting jobs, this chip breaker can be adjusted to meet individual conditions, in most cases, simply by varying the width."

RECOMMENDED WIDTH OF CHIP BREAKER (W)

Depth Cut Inches	FEED In. Per Rev. .008-.012	.013-.017	.018-.022	.023-.027	.028-.032
1/64 - 3/64	1/16	5/64	3/32	7/64	1/8
1/16 - 1/4	3/32	1/8	5/32	11/64	3/16
5/16 - 1/2	1/8	5/32	3/16	13/64	7/32
9/16 - 3/4	5/32	3/16	7/32	15/64	1/4

NOTE: A chip breaker depth of .020 is satisfactory for most types of ste

"THIS TABLE is a general guide to proper widths for ground-in step chip breakers. They represent starting points from which adjustments can be made to produce the most satisfactory chip, as determined by the breaking characteristics of the steel being cut."



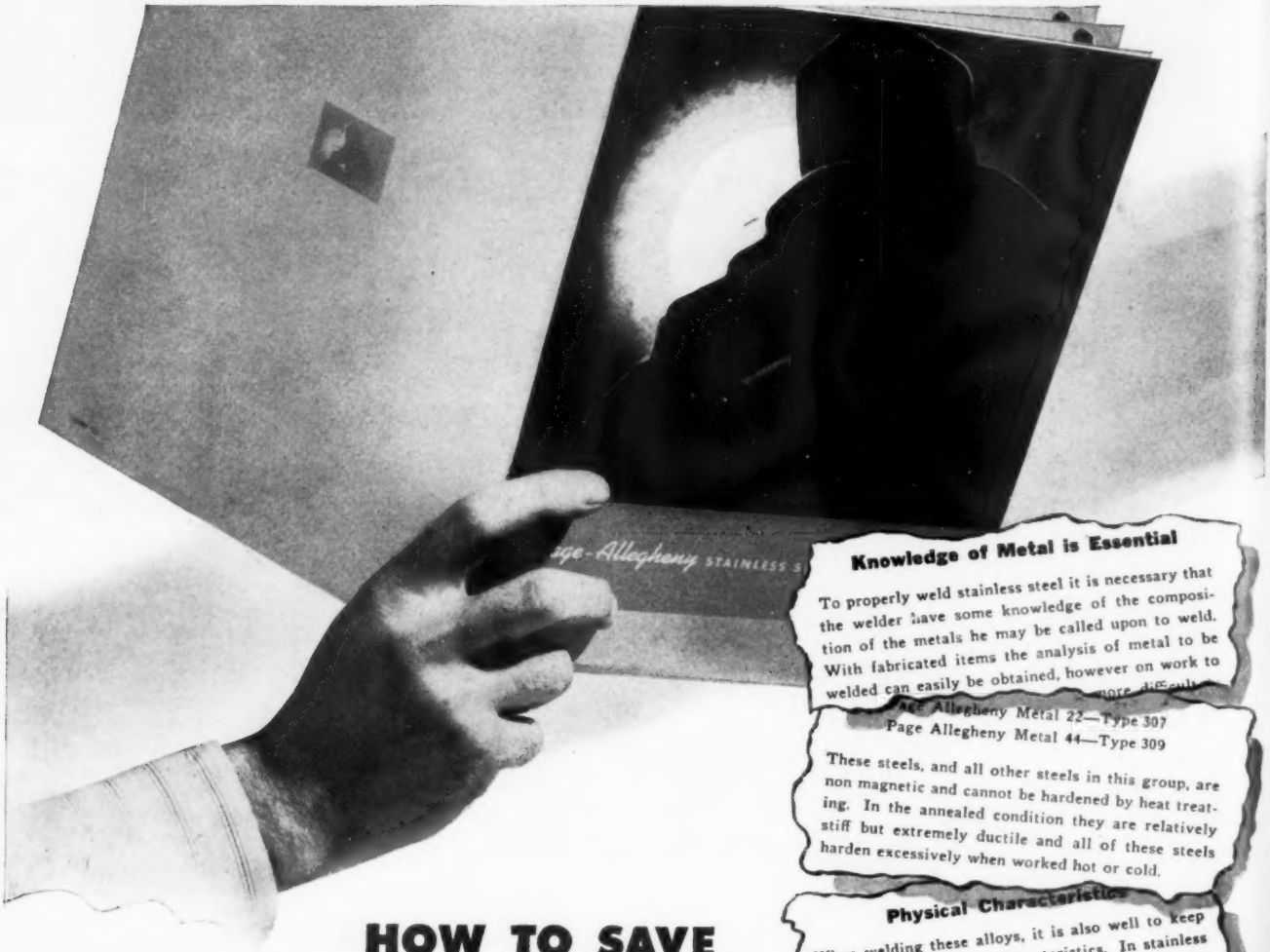
"AS THE ABOVE PHOTOGRAPH SHOWS, when the chip breaker is right, you get a chip easy to handle and easy on the tool. There are no dangerous spirals of steel 'hay' to injure the operator. When the chip breaker selected fits the job, chips peel off work uniformly and safely."

The selection of a proper cutting oil is as important as the selection of the right chip breaker. That's why Shell has developed a control technique that "balances" the oil to the machine, the application and the tool. Call in the Shell man now for details.

SHELL

SHELL LATA OILS

FOR METAL WORKING



HOW TO SAVE TIME AND MATERIAL WELDING *Stainless Steel*

★ This booklet will help you. You can get a copy by asking your local PAGE Distributor or writing us direct at the mill in Monessen.

It gives needed data on 42 Commercial Stainless Steels—analyses; physical characteristics; reaction to heat and to cold working; specific welding electrodes to use with each; correct amperage and voltage; polarity; length of arc; direction of arc; starting the weld; preventing undercutting, etc., etc.

A copy of this well illustrated booklet will be sent gladly as soon as your request is received.

Knowledge of Metal is Essential

To properly weld stainless steel it is necessary that the welder have some knowledge of the composition of the metals he may be called upon to weld. With fabricated items the analysis of metal to be welded can easily be obtained, however on work to

Page Allegheny Metal 22—Type 307
Page Allegheny Metal 44—Type 309

These steels, and all other steels in this group, are non magnetic and cannot be hardened by heat treating. In the annealed condition they are relatively stiff but extremely ductile and all of these steels harden excessively when worked hot or cold.

Physical Characteristics

When welding these alloys, it is also well to keep in mind their physical characteristics. In stainless steels, the coefficient of expansion is high and the heat conductivity is low, therefore, when setting up a job for welding these factors must be taken into account and allowance made for expansion and con-

STANDARD GRADES

The following list shows standard grades of stainless steels. Those which are not included in the standard classif on special order.

GRADE	TYPE NO.	CARBON	CHROME	
Allegheny 17/7	301X	.10-.20	16.00-18.00	
Allegheny "C"	302	Over .08-.20	17.00-19.00	
Allegheny Metal F.M.*	302B	Over .08-.20	17.00-19.00	7
	303	.20 max.	17.00-19.00	7
Allegheny "A"	304	.11 max.	17.00-19.00	
Allegheny "B"	305	Over .05-.20	18.00-20.00	
Allegheny "B" Spec.	306	.11 max.	18.00-20.00	7
Allegheny 22		Over .09-.20	19.00-22.00	

PAGE-ALLEGHENY STAINLESS STEEL ELECTRODES

CHROMIUM 18.
NICKEL 8.
CARBON .07 Max.
with COLUMBIUM
SIZE HEAT POUNDS NET

PAGE-ALLEGHENY 18-8 ELECTRODES with COLUMBIUM

Base metal and coating balanced to form weld metal of the following chemical composition: Carbon .07% Maximum; Chromium 18% Minimum; Nickel 8% Minimum with Columbium.

Recommended for welding all grades of Stainless Steel in which the chrome and nickel

PAGE-ALLEGHENY STAINLESS STEEL ELECTRODES

CHROMIUM 19.
NICKEL 9.
CARBON .07 Max.
SIZE HEAT POUNDS NET

PAGE-ALLEGHENY 19-9 ELECTRODES

Base metal and coating balanced to form weld metal of the following chemical composition: Carbon .07% Maximum; Chromium 19% Minimum; Nickel 9% Minimum.

Recommended for welding all grades of stainless steel in which the Chrome and Nickel content is over in excess of 18% and 8% respectively

PAGE WELDING ELECTRODES

PAGE STEEL AND WIRE DIVISION • MONESSEN, PA., ATLANTA, CHICAGO, NEW YORK, PITTSBURGH, SAN FRANCISCO

ACCO

AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT • CONNECTICUT

AIR SUPREMACY...

RESULTS DIRECTLY FROM ACHIEVEMENT
ON THE PRODUCTION LINE

Higher Speeds, Better Finish, Longer Tool Life

with

EN-AR-CO PROMAX CUTTING OILS

● Here's what a change to En-ar-co PROMAX Cutting Oils did for a Michigan Manufacturer, forming and cutting off nickel steel aircraft parts on Acme Gridley Automatics:

Before using PROMAX, indexing at 85 seconds, tools were reground at four-hour intervals and finish while passing, was not entirely satisfactory.

With correct grade of PROMAX Cutting Oil, the machine was speeded to index at 54 seconds, and higher speed notwithstanding, finish of work was improved and the interval between tool grinds was eight hours.

Needless to say the entire plant is now standardized on PROMAX.

Write today for information on the PROMAX Cutting Oils best fitted to your specific production needs.

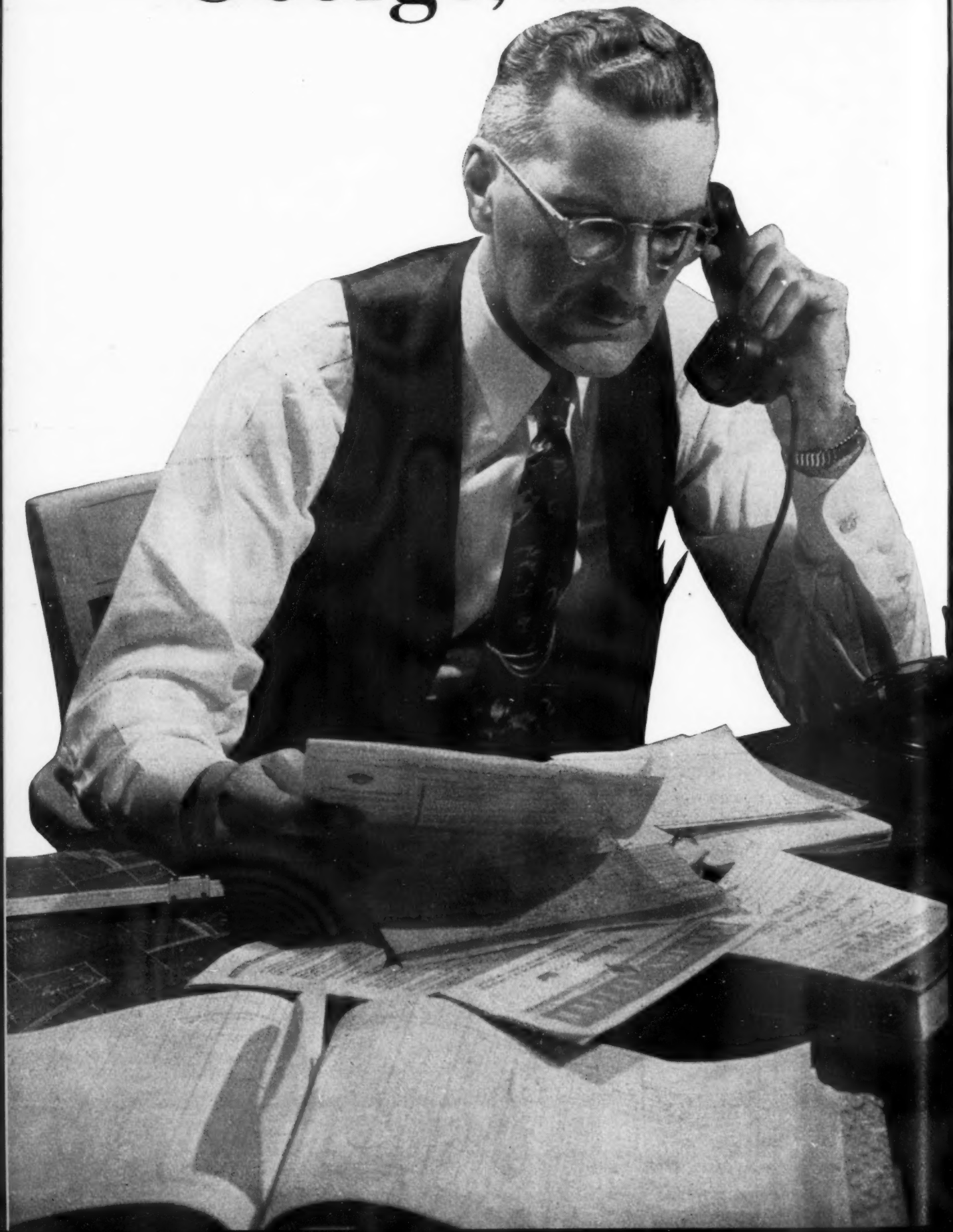
EN-AR-CO INDUSTRIAL LUBRICANTS

THE NATIONAL REFINING COMPANY

Cleveland • Indianapolis • Chicago • Peoria • Omaha • Kansas City • Memphis

East of Ohio — The Globe Refining Company, Cleveland, Ohio

George*, we'd like



to shake your hand

YOU'RE such a matter-of-fact fellow, George, that maybe it never occurred to you that you've done anything out of the ordinary since that fateful Sunday when America found itself at war.

Sure—you've just done your job as you saw it. But listen, George. Planning and engineering our war effort—keeping the wheels turning and supplies and materials moving—figuring out the million minor details . . . that took brains of a special sort. The vast load of paper work that had to be done before a single machine could function, before a single bomber could lay its eggs, didn't just do itself. You did it.

When bad news came over the wires, you set your jaw and worked just that much harder. And when the news was good, you took it with a quiet smile and kept right on plugging away. No, George, not all the heroes in this war are making the headlines.

The late hours you spent at your desk when the others had left . . . the way you've planned and sweated to meet one emergency after another . . . the extra work you've taken on your patient shoulders when younger men were called away for more spectacular, more exciting duties, wasn't exactly a snap, either.

Maybe you don't wear a uniform, George, but remember this. You're on the all-important staff of the home-front army. If it weren't for you, and the thousands of Georges like you, our job of war production would be in an awful mess right now.

Who is George?** ***Surely you know dozens of Georges. He stands beside you on a crowded bus early in the morning. You've watched him coming wearily home from work long after the rest of the neighbors have finished supper. He may even be the fellow who makes those funny faces at you as you shave before your mirror in the morning. More power to you!

CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh and Chicago

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
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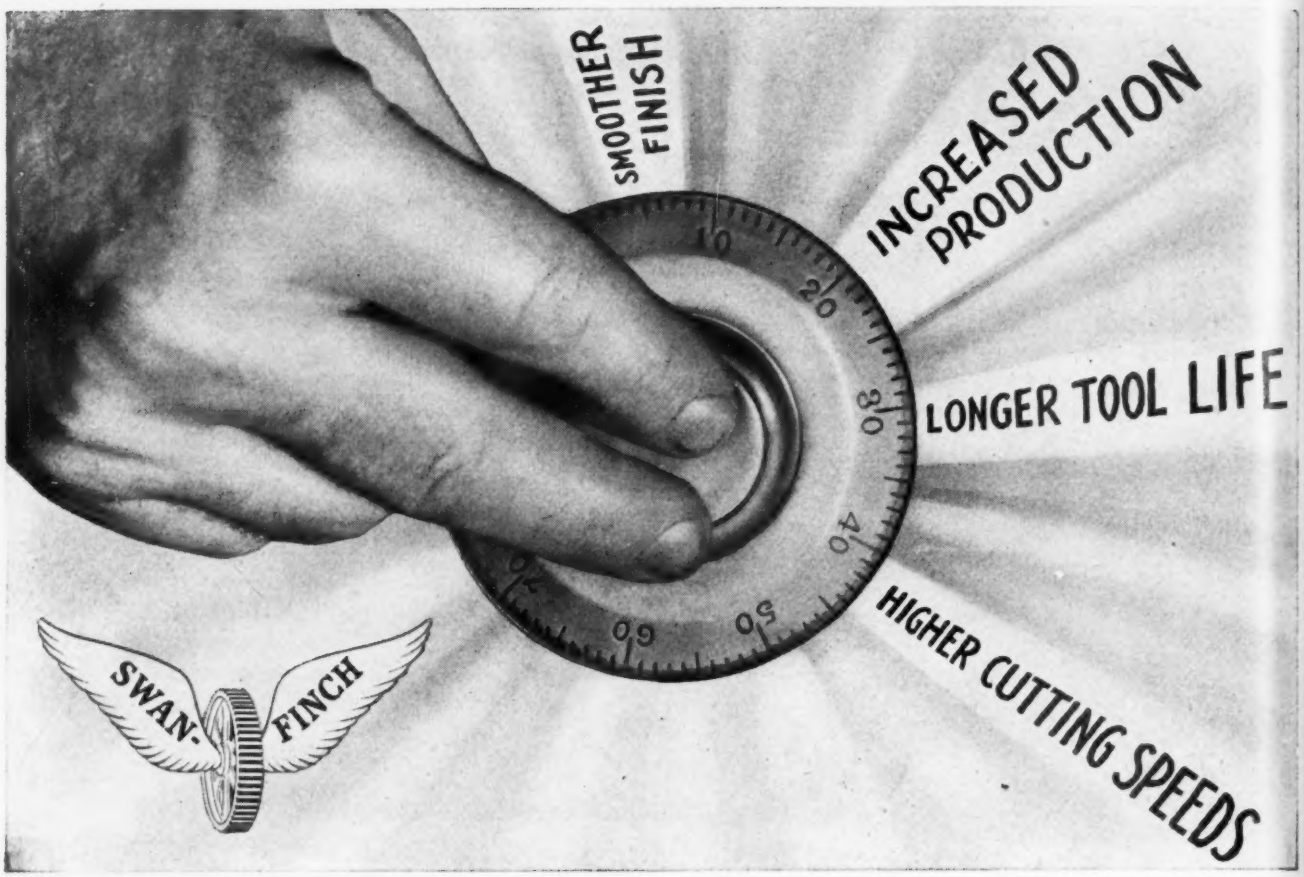
USS

UNITED STATES STEEL



SAFCO METAL WORKING LUBRICANTS

Right Combinations for increased production!

Right combinations of ingredients in metal working lubricants are like the right numbers on the dial of a safe, each one vital for opening wide the doors of production.

Swan-Finch 'SAFCO' metal working lubricants are combinations that have been continuously proved as scientifically correct.

Today high production schedules and precision specifications do not permit guesswork.

Swan-Finch, the makers of 'SAFCO', are lubrication specialists in the metal working field.

That's why more important plants engaged in vital war production are testing and specifying 'SAFCO' lubricants.

It will pay you real dividends to get better acquainted with the Swan-Finch field representative who covers your district. Capable and able, they are constantly devising *new* ways and means for stepping up production.

For instance meet "Bill" Holmes. He is one of our highly trained and experienced staff of fieldmen.

ASK US TO HAVE HIM CALL—NO OBLIGATION.

SWAN-FINCH OIL CORPORATION

Offices		Plants	
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Detroit, Mich.	2596 Hart Avenue	Detroit, Mich.	2596 Hart Avenue

ILLINOIS *Forging*

. . . . the source of STRUCTURAL STAMINA essential to maximum tool life!

Precise metallurgical control plays a most important part in the performance of high speed production tools. Specific composition, grain structure and hardness are fundamental factors in producing the tool best suited to the purpose for which it is designed.

Because correct forging contributes so greatly to tool endurance, "ILLINOIS" has its own modern forge shop where skilled craftsmen carefully work the metal to produce exactly the required structure.

For tools that must serve better and longer—call in "ILLINOIS."

OVERNIGHT TO ALL AMERICA . . .
FROM THE HUB OF AIR TRANSPORTATION

ARMY (E) NAVY

ILLINOIS TOOL WORKS

MANUFACTURERS OF METAL CUTTING TOOLS AND SHAKEPROOF PRODUCTS

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In Canada: Canada Illinois Tools, Ltd. Toronto, Ontario

ILLINOIS

HOBS · BROACHES · SHAPER CUTTERS · GEAR CUTTERS
MILLING CUTTERS · GROUND FORM TOOLS · SPECIAL TOOLS

CLOSE CYLINDER VALVE WHEN SHUTTING DOWN

Your regulators are built to give long, dependable service but careless treatment shortens their useful life. It's only sound common sense to give mechanical apparatus the best of care, and today it is essential because replacements are scarce.

For example, always close the cylinder valve when shutting down for long periods. Even if it's only for four or five hours, this precaution removes needless strain on the regulator seat. Repeated several times a week, these sensible "rest periods" add up to a valuable extension in regulator service.

Closing the regulator adjusting screw while setting up a new job is another way to prevent unnecessary wear on your apparatus. This step only takes a minute and eliminates useless pressure on hose and torch valves.

Make yourself a Waste Warden! Stay on guard against careless wear and wasteful practices. Take good care of your apparatus — keep every cubic foot of oxygen and acetylene working for America's smashing victory ahead!

WASTE WARDEN says

"Return Cylinders Promptly" and:

DO close cylinder valve after use.
DO check your hose and connections for leaks.
DO keep your cylinder inventory low.
DO keep tips clean and free from carbon and slag.

★ ★ ★

DON'T use excessive pressure.
DON'T use oversize tip.
DON'T leave torch burning when not in use.

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IDLE CYLINDERS ARE PRODUCTION SLACKERS: *Keep 'em rolling for victory!*

Save MAN-HOURS.. *Protect* MAN-POWER

WITH SQUARE D COMBINATION STARTERS

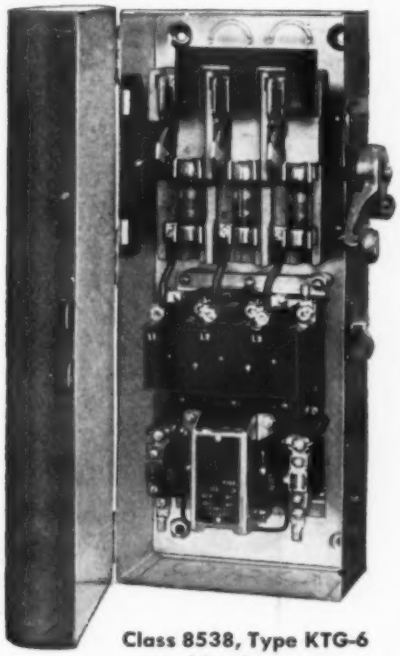
Square D combination starters (disconnect switch and motor starter in one cabinet) save valuable man-hours and material even before they are put in service—and every time inspection or maintenance attention is required thereafter.

Model 2K vertical Milwaukee milling machine manufactured by Kearney & Trecker Corporation

With only one device to mount and wire, installation is simpler—takes less than half the time needed to mount separate units. Complete accessibility makes servicing a fast and simple routine.

Safety features protect man-power. Cover interlock makes it impossible to open the combination starter unless the disconnect switch is in the "OFF" position. Switch handle may be padlocked "OFF" for positive protection while machine is being adjusted or repaired.

Enclosure steel and wiring materials are conserved because switch and starter are mounted in one box and already wired together.



Class 8538, Type KTG-6 combination starter

Standard Square D safety switches serve as the motor circuit disconnect. Operation is quick make and break. Switch blades are visible for easy inspection. Switch can be operated for testing after cabinet door is opened.

The Square D motor starter has straight line vertical action with double break, trouble-free silver contacts. All renewable parts, including magnet coil and contacts, can be inspected or replaced in a matter of seconds, using only a screwdriver *and without disturbing connections or removing the starter from the cabinet.*

CALL IN A SQUARE D FIELD ENGINEER

If you have a problem which involves electrical distribution or control, call in the nearest Square D Field Engineer. Backing him up in every Square D plant, are design and engineering specialists with complete research and testing laboratories at their command. There are Field Engineers in Square D branch offices in 52 principal United States and Canadian cities.

SQUARE D COMPANY

DETROIT - MILWAUKEE - LOS ANGELES

KOLLSMAN INSTRUMENT DIVISION, ELMHURST, NEW YORK

IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

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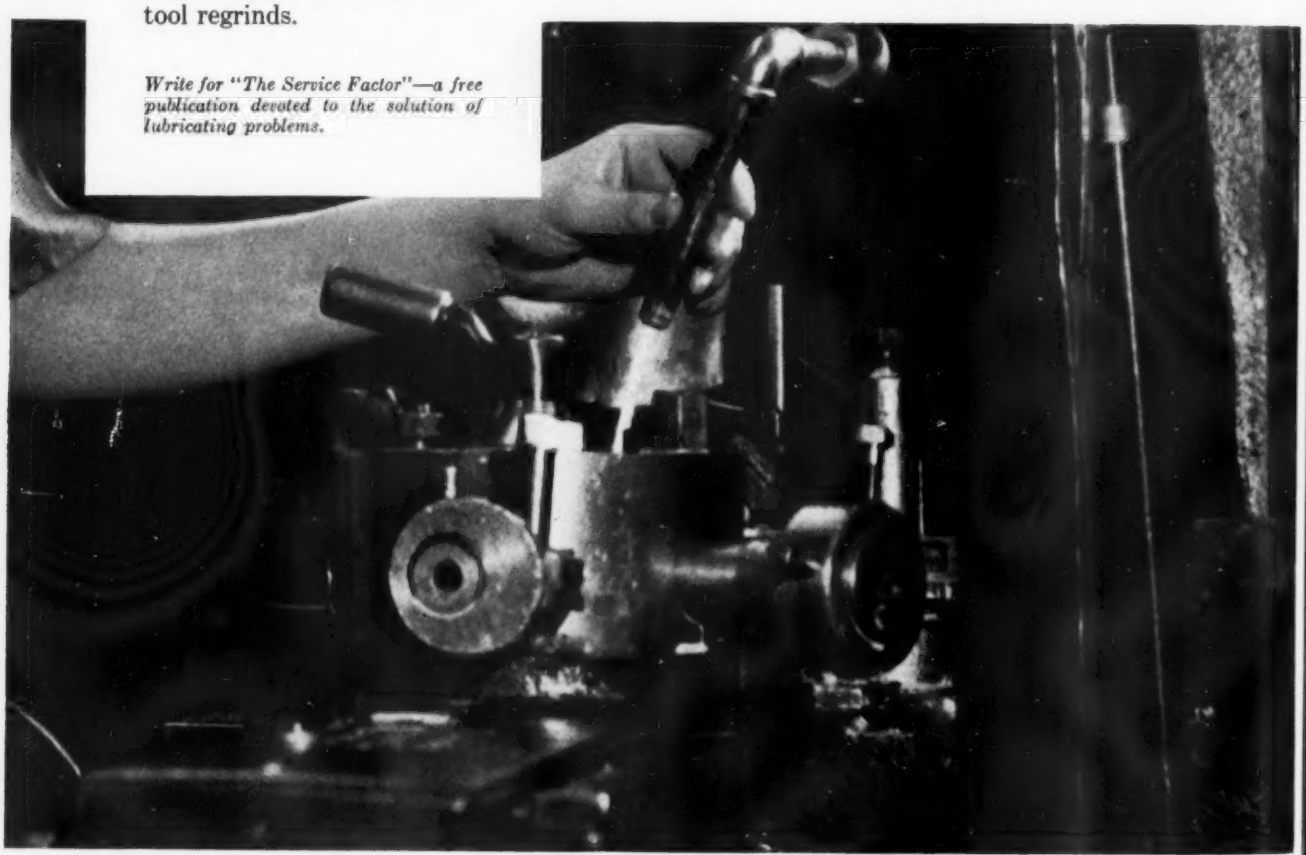
. . . SINCLAIR CUTTING OILS AND COOLANTS. These oils promote high precision and fine finish in stepped-up operation, with less time out for tool regrinds.

Write for "The Service Factor"—a free publication devoted to the solution of lubricating problems.



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Strength

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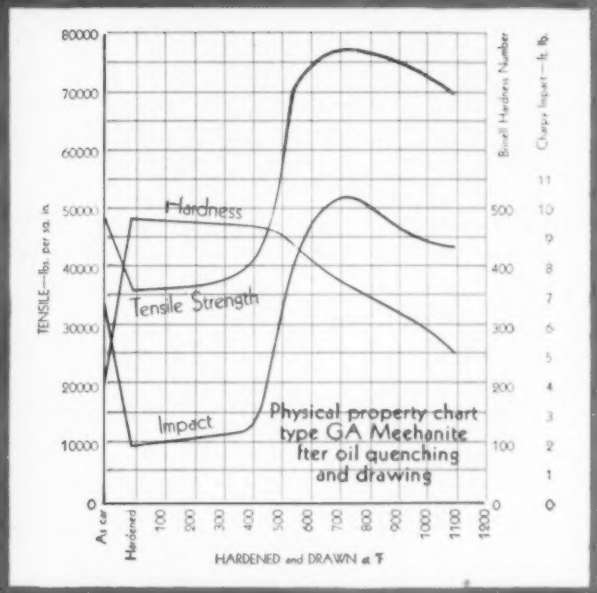

As shown by the above curves certain Meehanite castings are susceptible to heat treatment much in the same manner as carbon tool steel. By heating above the critical change point and quenching they will be hardened. If cooled slowly in the furnace they will be softened. To improve strength and toughness a quenching followed by a drawing treatment is recommended. Tensile strengths above 70,000 pound p. s. i. and Brinell hardness up to 500 may be obtained. Impact strength, transverse strength, and deflection are also improved.

Meehanite castings do not usually require annealing to soften for machinability, or for stress relief. However, when such treatment is desired Meehanite castings will respond to low temperature or high temperature annealing.

Meehanite Foundries have full information on heat treatments and will be glad to discuss the subject with you.

MEEHANITE RESEARCH INSTITUTE · 311 Ross St., Pittsburgh, Pa.

MEEHANITE

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Making the Most of Meehanite

All Types and Sizes of the Fastest Set-up Devices...

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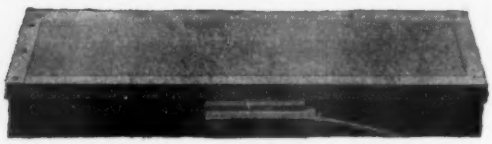
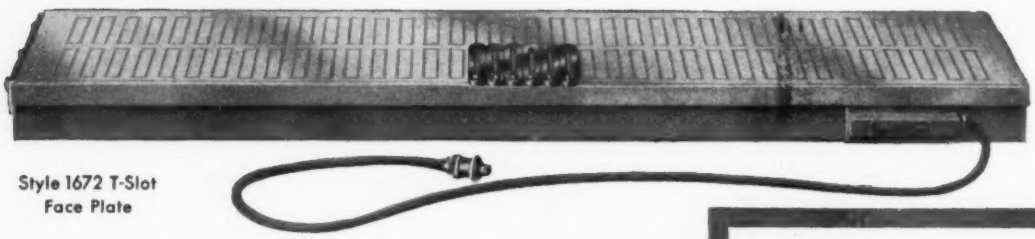
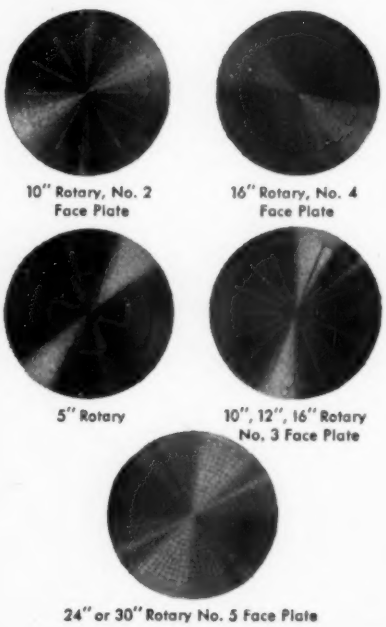


Style 1236 Fine Mesh Face Plate

Size No. 408-DB Precision Duplex



Style 1672 T-Slot Face Plate



10" Rotary, No. 2 Face Plate

16" Rotary, No. 4 Face Plate

5" Rotary

10", 12", 16" Rotary No. 3 Face Plate

24" or 30" Rotary No. 5 Face Plate

You can get exactly the *Superpower* you need to speed high-rating war production by saving set-up time . . . not only on grinders . . . but also on millers, planers, shapers, lathes. *Superpowers* are useful, too, in non-machine applications wherever there is a problem of holding ferrous materials. The full line includes rectangular, tilting base, and rotary models . . . each with greater holding power and magnetic area than other chucks of equal dimensions.

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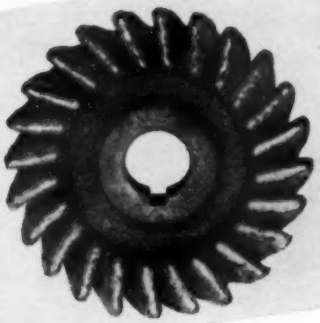
MILLING CUTTERS
made on the job with
COLMONOY WCR-100

CARBON STEEL CASTING



COLMONOY APPLIED

GROUND TO SIZE

Here's what one manufacturer did to keep a mill on the job. With an old milling cutter as a pattern he made castings of carbon steel. These were built up by welding COLMONOY WCR 100 to the cutting edges, after which the cutters were finish ground to proper size.

This is but one example of the many uses of COLMONOY. Wherever there is the need for hard facing, wherever there is the need for maximum resistance to abrasion and corrosion, COLMONOY will effect economies in production costs. It is available in many grades, and is easily applied by the welding process.

If you have a wear problem, requiring hard facing, or a possible use of hard facing that may affect your operations, our engineers will be glad to discuss the matter with you and co-operate in developing unique applications to meet your specific needs.

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Molecular Bond Chromium Plating, a research development by Industrial Chromium Corporation, is precisely what its name implies—an intermingling of the molecules of the base metal with those of the applied chromium. This adhesion reduces embrittlement and assures almost complete elimination of the peeling or chipping which sometimes occurs under abnormal conditions of service.

This extra ordinarily adherent deposit has been proved in actual service under a wide variety of conditions. It is the answer in cases where the usual method of chrome plating has not proved entirely satisfactory.

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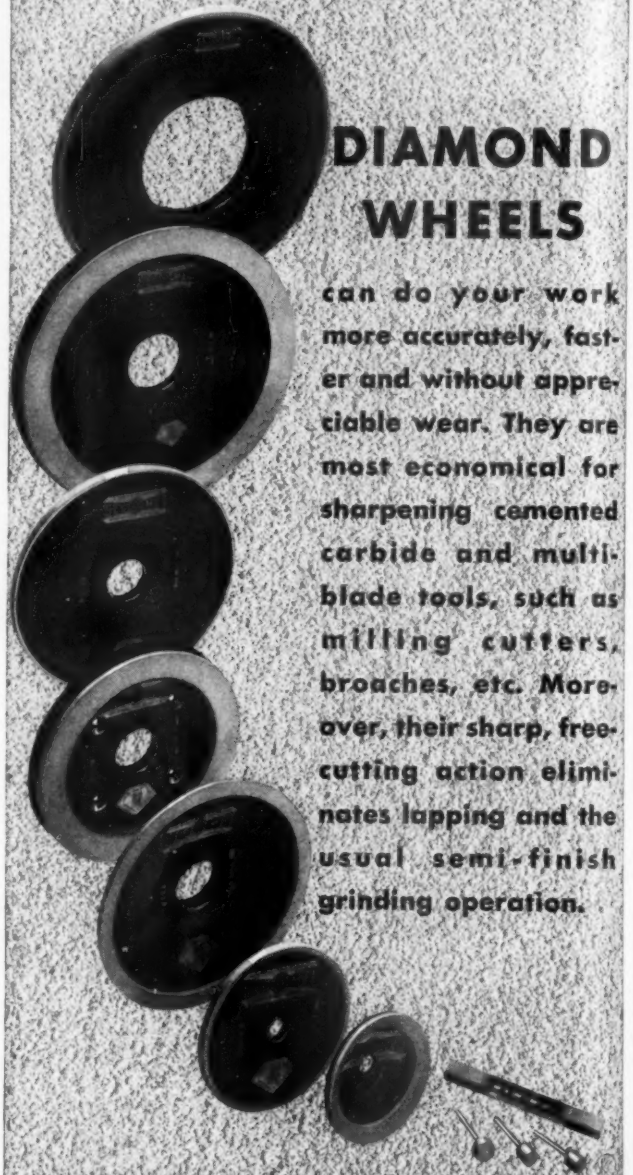

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can do your work more accurately, faster and without appreciable wear. They are most economical for sharpening cemented carbide and multi-blade tools, such as milling cutters, broaches, etc. Moreover, their sharp, free-cutting action eliminates lapping and the usual semi-finish grinding operation.

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THE GENERAL MANAGER ASKED:

"Why change to Ozalid Whiteprints?"

YOU CAN COUNT ON the General Manager firing a line of questions when radical changes are suggested.

Here are three questions frequently asked by hard-thinking, hard-boiled executives when the engineering department requisitions an Ozalid Whiteprint Machine. And here are some sound reasons why so many have been convinced of Ozalid's superiority over old-fashioned print-making methods.

Q. ***What's wrong with our present equipment?***

A. Compare with Ozalid's. An Ozalid machine turns out whiteprints of engineering drawings, charts, letters in two fast steps—EXPOSURE and DRY DEVELOPMENT. There are no liquid baths, no plumbing connections, no solutions to mix. A score of other maintenance headaches have also been eliminated.

And, an Ozalid Whiteprint Machine is so clean and compact . . . it may be installed right in the drafting room. Anyone can operate it at top efficiency.

Q. ***Why is the Ozalid Process the most versatile?***

A. You can do so much more! (a) You can make prints having black, blue, or maroon lines on a white background. The maroon line is recommended for the shop since it shows the greatest contrast to grease and dirt . . . and will stand up better than the white line of a blueprint. (b) You make duplicate originals the same way you produce standard prints—without Van Dyke tieups. (c) You can use cut sheets as well as roll stock in an Ozalid machine. Thus, you can completely eliminate trimming waste by using sheets the size of your tracings.

Q. ***How can Ozalid save a thousand hours in our drafting room?***

A. Give a draftsman an Ozalid duplicate of a tracing which you want changed in part. He'll have a "new" original in a fraction of the time required with other methods. First, he eradicates the obsolete lines with Ozalid Corrector Fluid. Then he draws in the new design. It's that easy! It's *never* necessary to redraw any line which remains the same as in the original.

Think of the changes you're making in your products today. Think of the changes you'll be making in the post-war period. By installing an Ozalid Whiteprint Machine—you'll be sure of a "head start."

OZALID PRODUCTS DIVISION

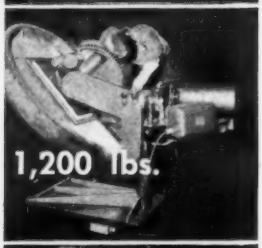
GENERAL ANILINE AND FILM CORP.

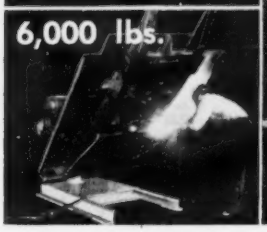
Johnson City, N. Y.

Write for "Simplified Printmaking." It shows how leading manufacturers save time, labor, and materials with the Ozalid Process.

C-F POSITIONERS

. . . the capacity you need . . . the features you want





Not only for the welding you are doing today, but for the increased amount of welding you will do in the future, you will want C-F Positioners.

(1st) Because "position welding" is generally specified now.

(2nd) Because the C-F Positioner Line provides the exact size and type positioner needed for every shop.

(3rd) Because C-F Positioners have the special design and operational features which make them universal tools—adjustable height pedestal and boom-type bases that increase tilt and operator and floor clearance; manual, motor or variable speed controls, greater capacity for rating etc.—features that assure efficient handling not only of today's job but of tomorrow's as well.

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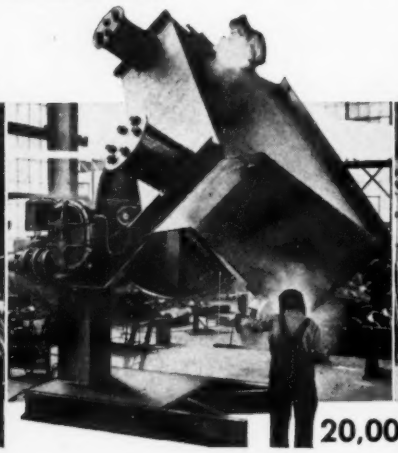
Write for Bulletin WP 22.



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. . . . and where ordinary soluble oils or paste compounds fail to give you satisfactory finish or tool life — USE Solvol! Developed especially for carbide and other high speed tools. Solvol has advantages to offer you in many applications. Put it on the job and watch the improvement.

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For All Cutting Fluid Problems

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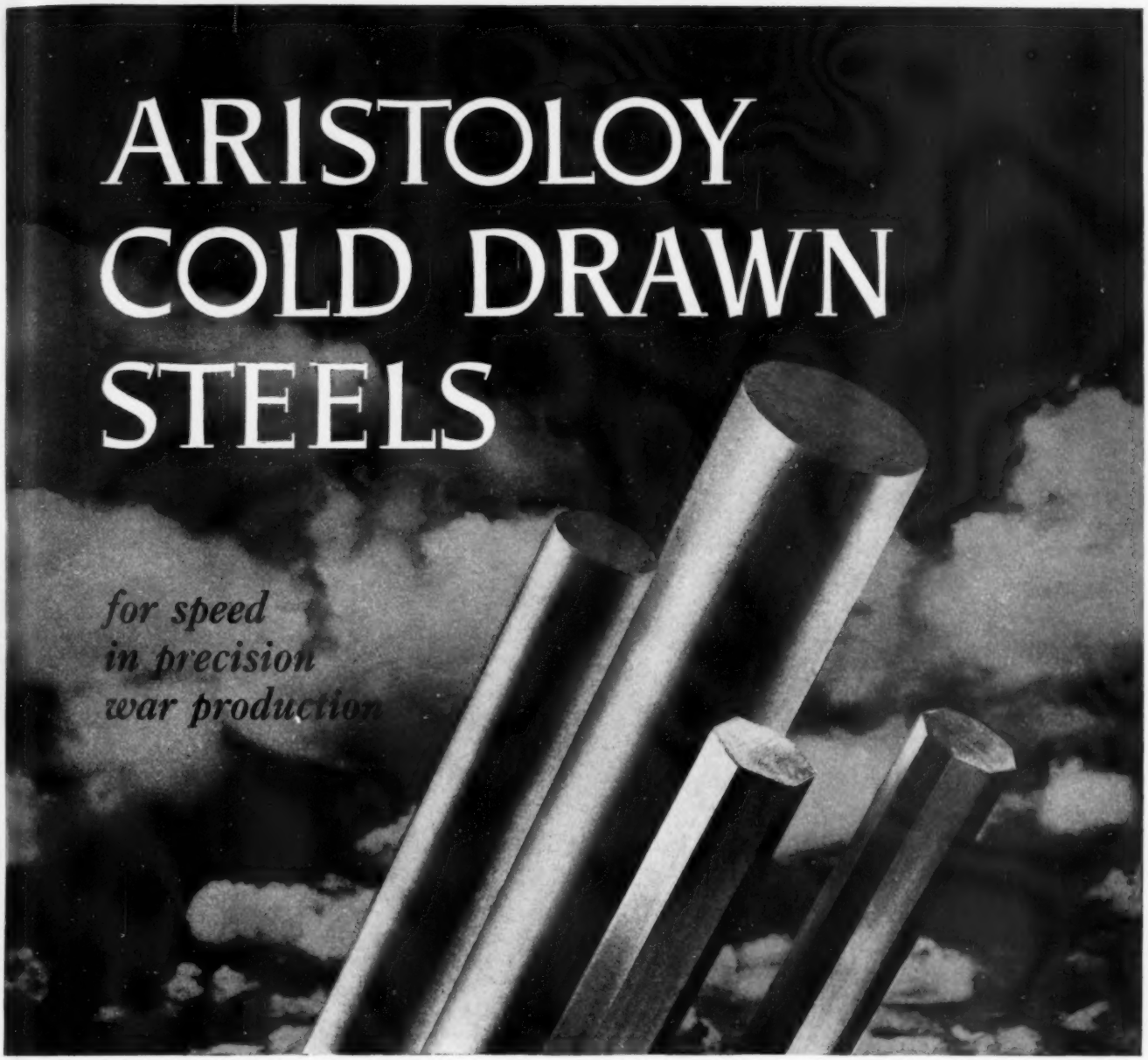

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No. 575

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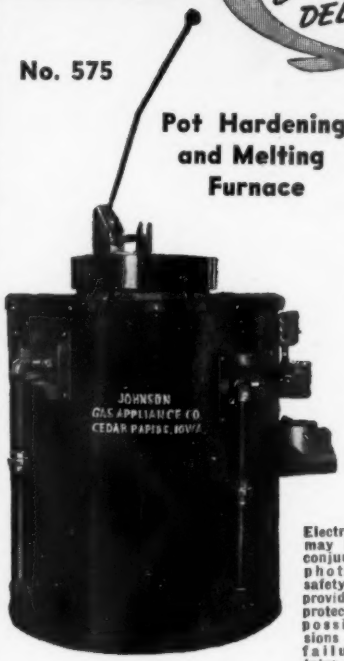
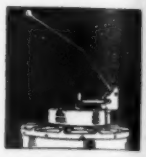
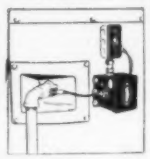




Lid-lifting mechanism easily raises cover. Locks in up position.

Heavily insulated—4½" firebrick backed up with 3½" insulating block.

Electric ignition may be used in conjunction with photo-electric safety system to provide complete protection from possible explosions due to gas failure. Facilitates lighting of burners.



Burners in 575, located near top of combustion chamber, insure longer pot life. Large blower assures maximum performance. Vent damper regulates flow of exhaust gases, and may easily be connected to duct to remove gases from building. Semi-concealed piping gives better appearance and keeps pipes out of operator's way. Top ring, in 3 sections, to prevent cracking or distortion. Price $315.00 F.O.B. Factory. *Blower Extra.*

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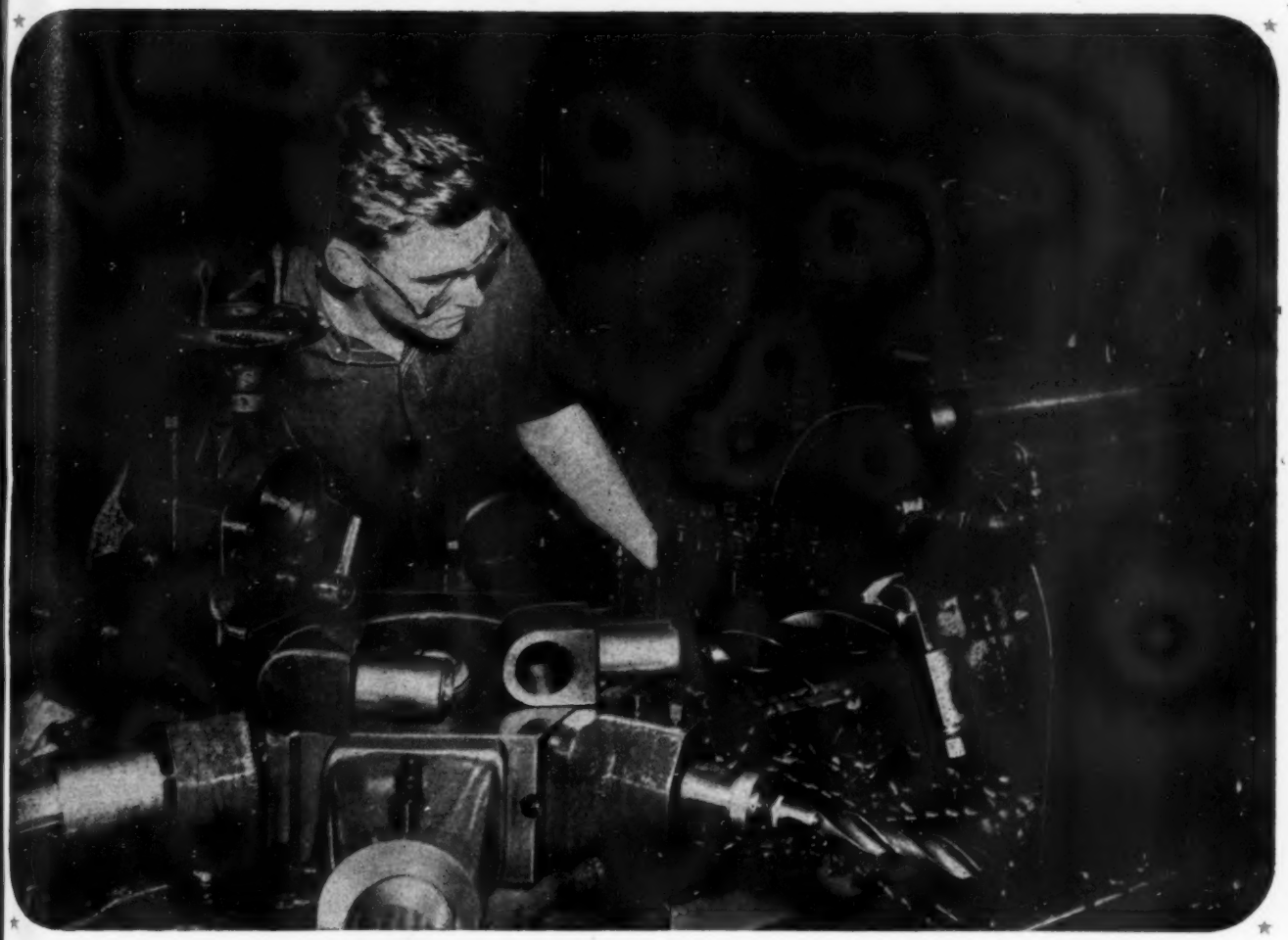

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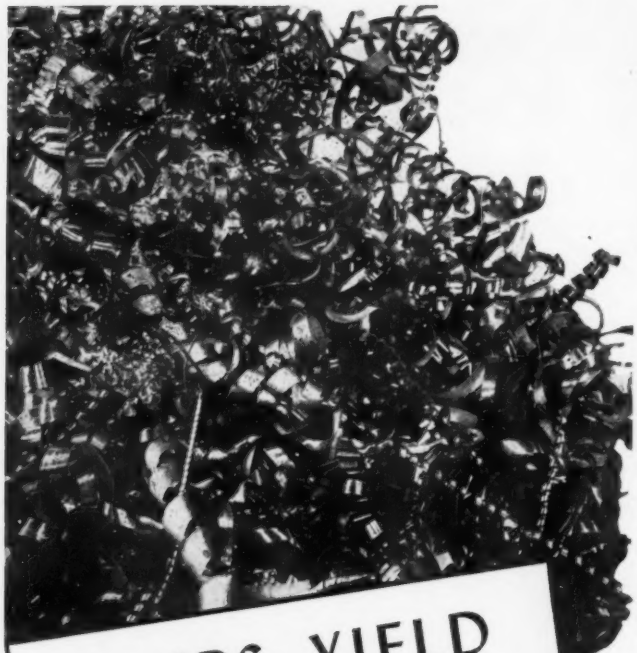

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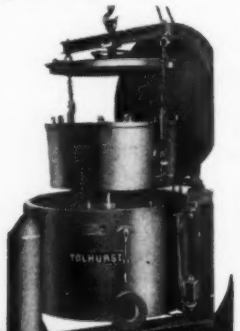

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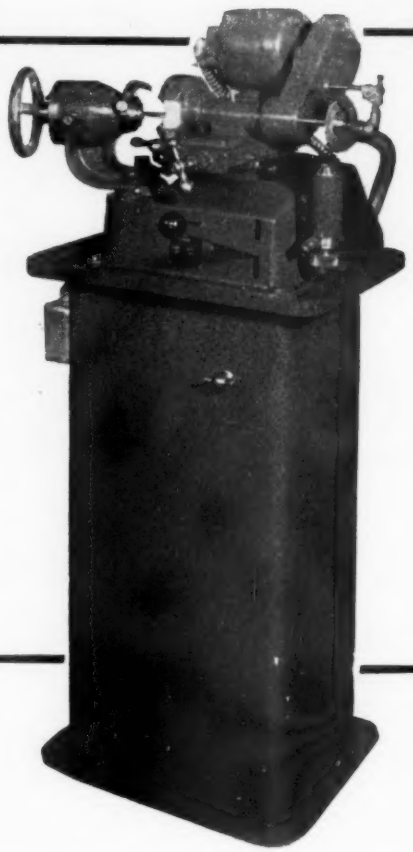

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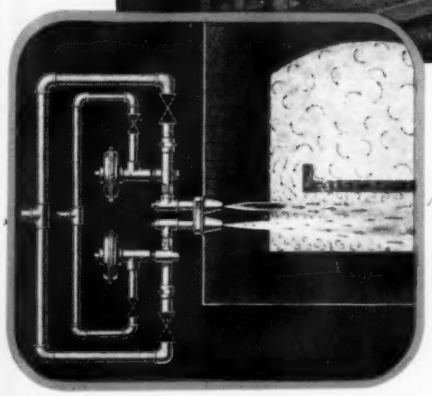

SC Conjecto-Firing is accomplished by the use of twin nozzle burners, one nozzle located vertically above the other, with one or more sets of burners incorporated in a single casting. The lower nozzles are manifolded to one inspirator and the upper nozzles to another. Temperatures under 1000° F. — one set operates with usual correct air-gas ratio and other set with gas valve closed and air valve open.

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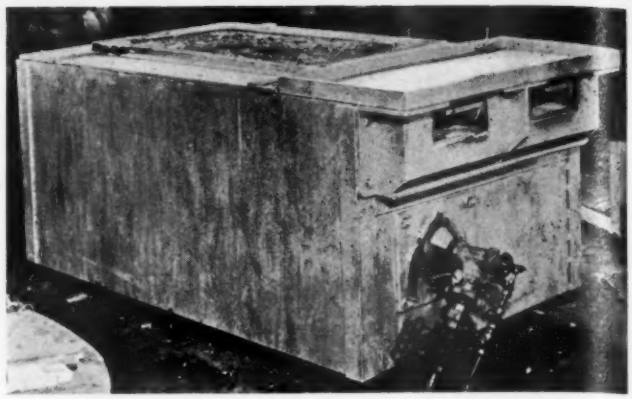

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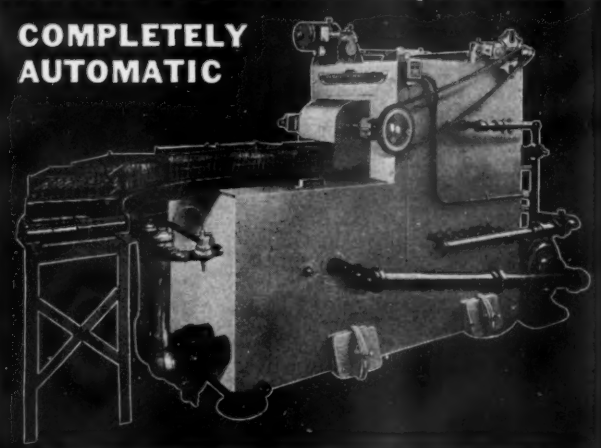

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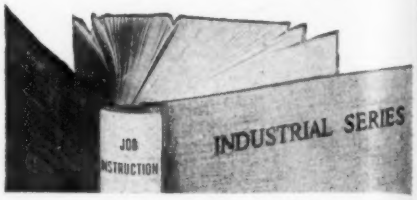

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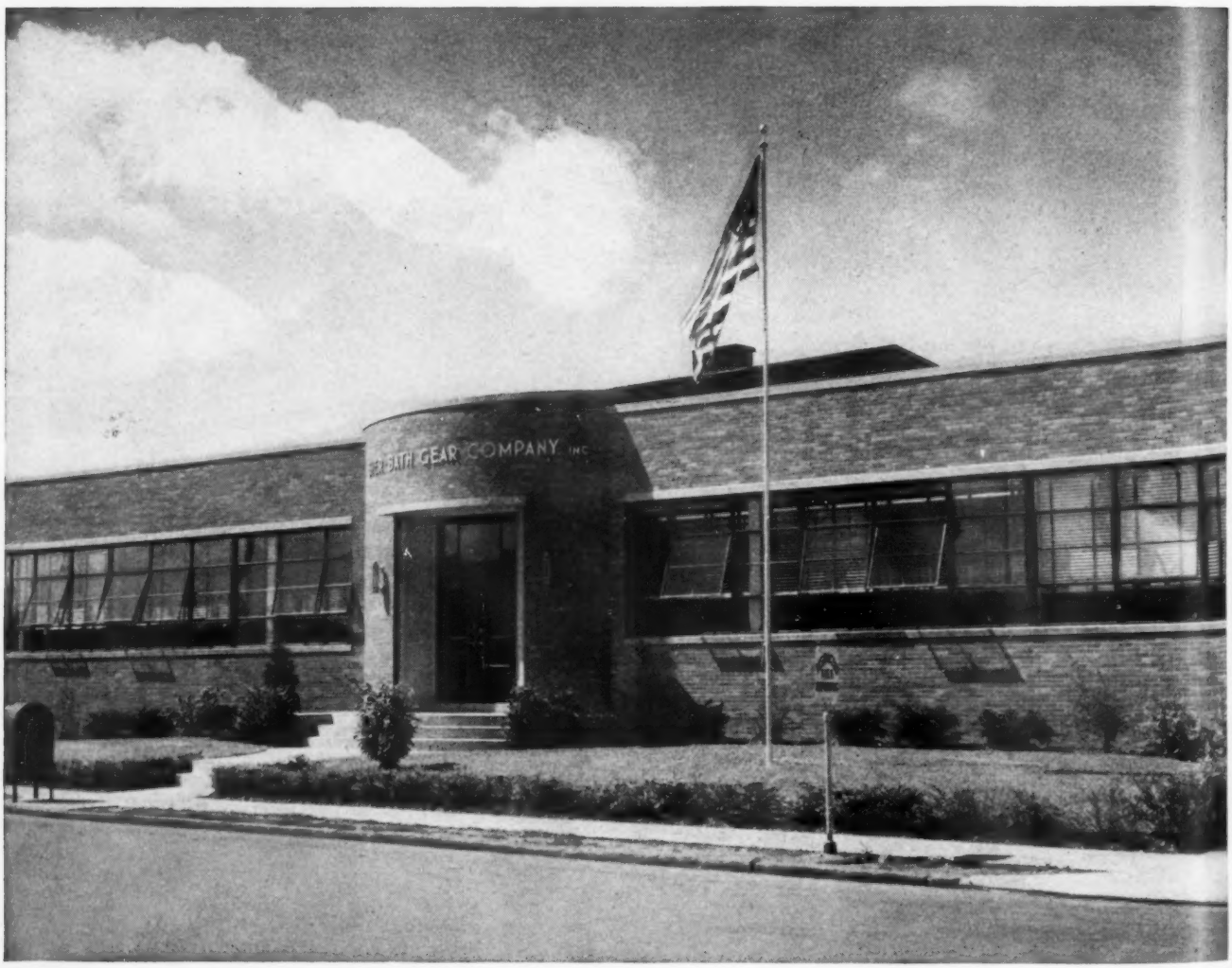

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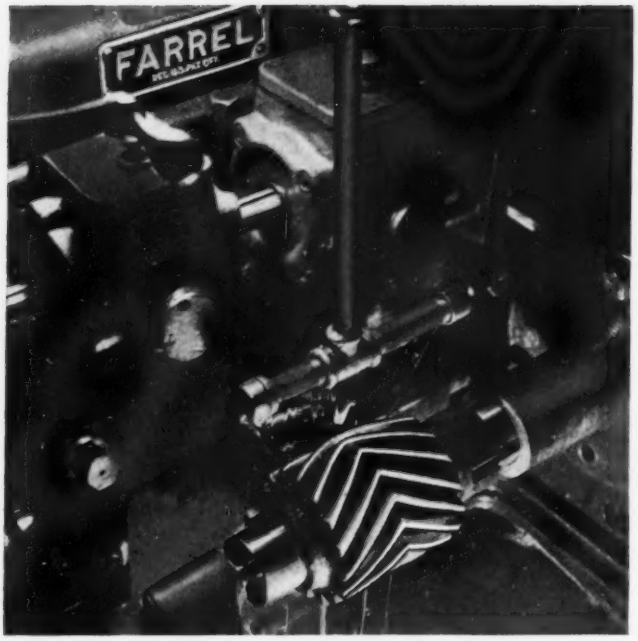

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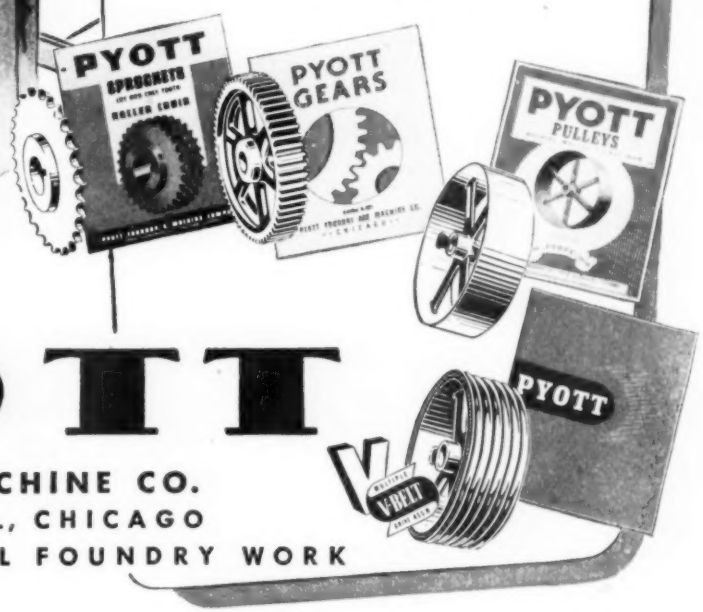

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(MULTIPLE DISC) CLUTCH

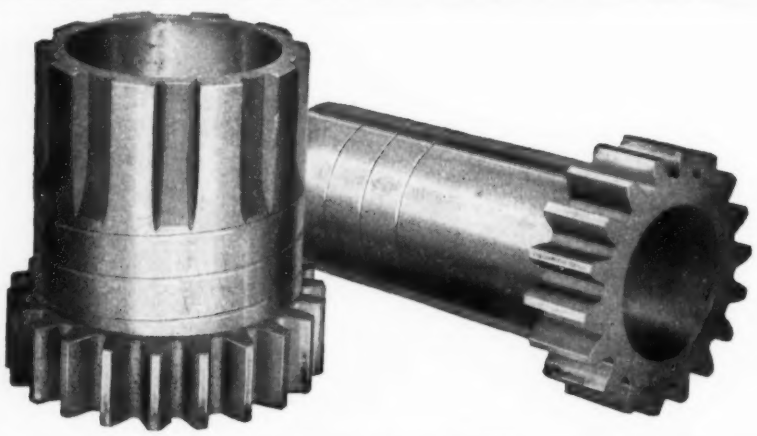
This new JOHNSON design—the result of more than 40 years specialization in the development of friction clutches—is particularly adapted to machine tool application because of its compactness, simple adjustment and easily controlled engagement. It can be assembled or disassembled without the use of tools. Floating plates minimize drag, abrasion or heating in neutral.

"MAXITORQ" FLOATING PLATE MULTIPLE DISC CLUTCHES are available in dry (self lubricated) and wet (running in oil) types in single, double and cut-off coupling types. Capacities range from ½ HP to 5 HP at 100 r.p.m. Send for detailed dimension sheets.

WRITE FOR MULTI DISC CLUTCH CATALOG NO. 33

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

"HARTFORD"
GEARS • CAMS
THREAD GRINDING
. . . TO YOUR SPECIFICATIONS
When you come to "HARTFORD" you get what you order—without delay—at reasonable cost.
Send specifications—ask for quotations.
THE HARTFORD SPECIAL MACHINERY COMPANY
HARTFORD, CONN.

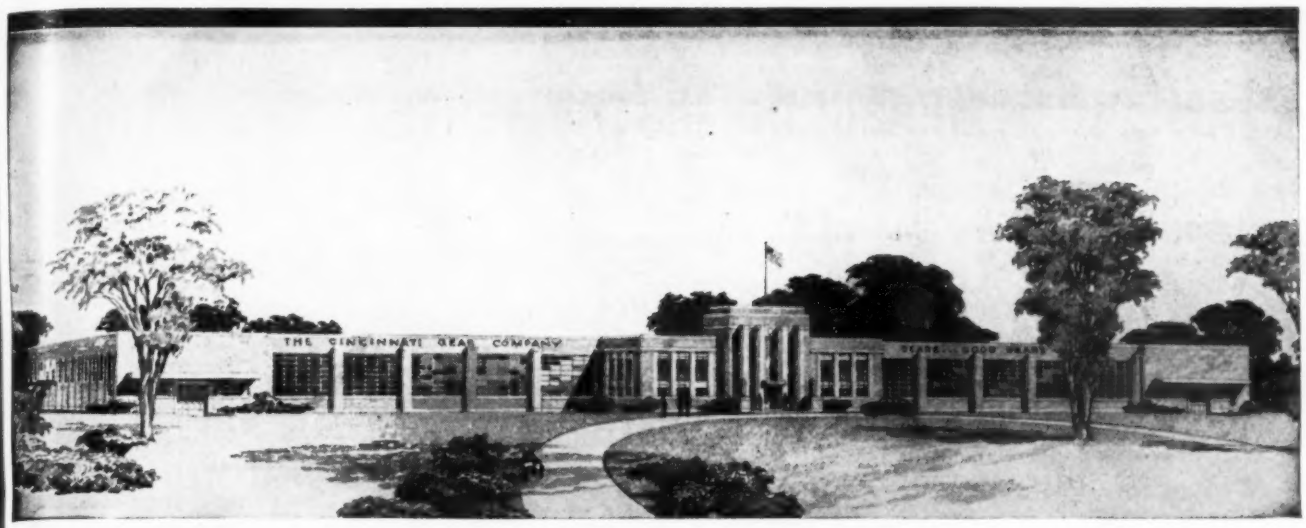


ADAMS GEARS

SPUR — HELICAL — WORMS
BEVEL — MITER — RACKS

Splined Shafts A Specialty

THE ADAMS COMPANY
Est. 1883
1942 Bridge St. Dubuque, Iowa



CINCINNATI GEAR EXPANDS

To produce more gears
• for more equipment
• for more fronts

With so much depending upon the continued functioning of all mechanical equipment under severe fighting conditions on our far flung fronts it is particularly important that the varied gearing used on this mechanical equipment be the best possible.

The large number of plants, now engaged in War Work, using Cincinnati Gears gives evidence of their accuracy—adherance to close tolerances and dependability.

In order to facilitate and increase our present schedule of production we have increased our plant capacity.

We have, we believe, the most complete assembly of personnel, involving highly trained, skilled craftsmen . . . technicians . . . and engineers, plus the greatest range of precision machinery, instruments and testing devices obtainable.

Cincinnati Gear Company has gone "all out" for war production. We pledge our every effort to make more and more "Gears, Good Gears Only".

CINCINNATI
makes all kinds of gears
- SPUR
- BEVEL
- HELICAL
- SPLINE
- WORM
- SPECIAL

"GEARS Good Gears Only"

THE CINCINNATI GEAR COMPANY
MARIEMONT AVE. and WOOSTER PIKE • CINCINNATI, OHIO

AMERICAN MEASURING INSTRUMENTS CORPORATION

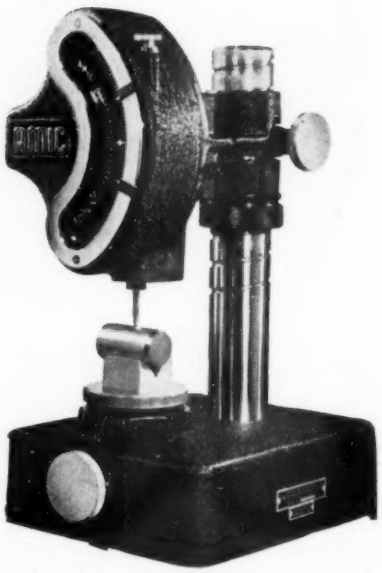
Announce their removal to:

240 West 40th Street, New York City

where augmented facilities, efforts and skills will be, as in the past, at the disposal of their clients.

AMERICAN MEASURING INSTRUMENTS CORPORATION

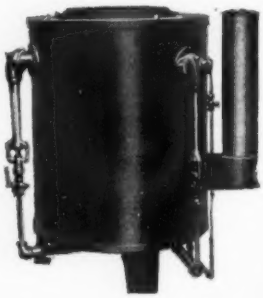
240 West 40th Street, New York City



AMIC PRECISION INDICATING GAUGE

MANUFACTURERS OF INDICATING GAUGES, PLUG RING SNAP GAUGES, JIGS, FIXTURES AND INSTRUMENTS

Atmospheric Pot Hardening Furnace



"BUZZER" HIGH SPEED *Gas* FURNACES

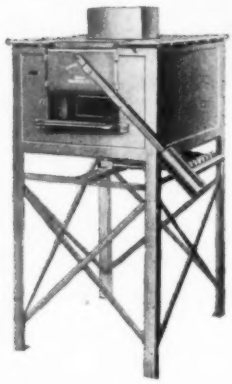
. . . are the efficient, economical answer to today's Heat Treating Problems. *NO BLOWER or OTHER AUXILIARY POWER are needed . . . just connect to your gas supply.*

• The Full Muffle Furnace attains a temperature of 2400° F., and The Pot Hardening Furnace, tangentially fired to assure even heat up 1650° F., are two of many models available.

• Send for the new "BUZZER" Catalog showing full line of Industrial Gas Furnaces, Burners and other equipment.

CHARLES A. HONES, INC.
121 So. Grand Ave. Baldwin, L. I., N. Y.

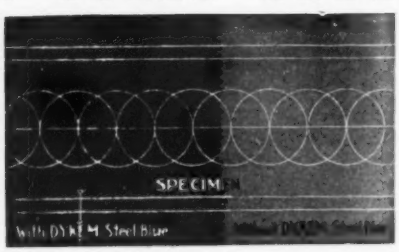
Full Muffle Furnace



DYKEM STEEL BLUE

STOPS LOSSES

making dies & templates



simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information.

THE DYKEM COMPANY, 2301 B N 11th St., St. Louis, Mo.
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LITTELL AUTOMATIC CENTERING REELS

No. 3 Littell Automatic Centering Reel. Coil capacity, 300 lbs.

ASK FOR BULLETINS

Plain and Motor Driven Spindle and Cradle Types

FASTER loading, centering and unreeling of coil stock is assured with LITTELL Automatic Centering Reels. Made in 100-lb. to 20,000-lb. capacities, for hand or automatic feeding. Spindle and Cradle types.

LITTELL PRODUCTS INCLUDE:

Roll Feed units for punch presses—Feeding and Straightening Machines—Power Straightening Machines—Ball-Bearing Reels—Winders—Coil Cradles—Air-Blast Valves and Nozzles—Safety Pickers—Scrap Cutters—Oilers—Assembly Machines—and Automatic Centering Reels. *REQUEST BULLETINS.*

F. J. LITTELL MACHINE CO.
4169 RAVENSWOOD AVE., CHICAGO, ILL.

Striking the Enemy

H-W Taps deliver long, accurate runs between grinds . . . minimize down time and reduce rejects. And H-W Taps retain precision longer . . . because the "Hanson Process," our exclusive method of finishing after hardening, insures uniform grain structure from tip to shank. Speed up production by looking for the "Hanson Process" Emblem on the taps you buy. For more detailed information please write.

"HANSON" PROCESS

LOOK FOR THIS EMBLEM

The HANSON WHITNEY MACHINE CO

HARTFORD CONN., U.S.A.

MARKED FOR ADOLPH

on a

NOBLEWEST

To "Pass the Ammunition" with speed and accuracy every single shell must have permanent identification. Millions of shell bodies of many calibers are being marked and knurled with precision and speed on Noblewest Marking Machines. The same Noblewest rolling process that speeds these shells on their way to spell the doom of the Axis can be applied to marking your products faster, better and at lower cost. Write today for catalog supplement No. 43.

NOBLE & WESTBROOK MANUFACTURING CO.

Marking Specialists Since 1904

EAST HARTFORD, CONN.

MODEL 162

Tooled for heavy duty cross line knurling in band seat of 37 MM high explosive shell bodies. Can be used for deep marking of similar shaped parts.

MARK IT BEST WITH NOBLEWEST® NOBLEWEST IMPROVED MARKING DEVICES

ERRINGTON

STAPLETON, STATEN ISLAND, N. Y.

MULTIPLE HEADS

Super-Sensitive Fixed Center Multiple Drilling Heads

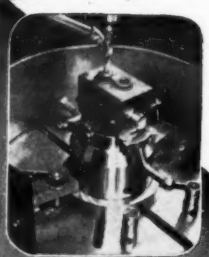
Fixed-Center Auto-Reverse Multiple Tapping Heads

All Parts Fully Enclosed to Insure Pressure Lubrication and Rigid Support of Adjustable Spindles

ADJUSTABLE MULTIPLE SPINDLE DRILLING HEAD

Get this Bulletin— ON INDEXING AND HOLDING COLLET FIXTURES

Zagar Indexing and Holding Fixtures are extremely simple in design (one handle, for example), very rugged, fool-proof, virtually indestructible. They make possible short cuts which jump production and profits. Get the latest, well illustrated full story. Ask for our BULLETIN A-1



Using 2" Zagar Index Fixture with special drill jig for drilling and loading simultaneously has doubled production. Let us engineer and tool your production problems.

ZAGAR TOOL, INC.

23880 Lakeland Blvd. Cleveland, Ohio

Here's sting

(AND PLENTY OF IT!)

FOR THE GUN THAT TEARS ZEROS TO PIECES

AIRCRAFT armor, within practical limits, is no protection against the terrific fire-power of America's .50 calibre machine gun. The high ratio of enemy planes destroyed for each one of ours lost is one measure of the lethal sting it carries.

That sting—in the form of a new bullet-core steel—was developed more than two years before the ".50" began to stutter in the far East and over the battlegrounds of Europe and Africa. At that time, .50 calibre bullet-core steel was made with tungsten—and was entirely limited to electric furnace production.

Foresighted ordnance experts, who realized the danger inherent in America's dependence on tungsten imports, put it up to steel makers to produce a substitute steel for bullet-cores *without tungsten*. It was a tough job and was marked "urgent."

Our metallurgists and steel engineers went to work. Using only domestic alloys they developed a steel that meets every requirement of the U. S. Government. From cold finished bars of this steel, bullet cores can be produced almost 50% faster. Even more important, this steel can be made by the Open Hearth process.

As a result—even with tungsten supplies cut off—our munition makers today are able to turn out .50 calibre bullet cores in quantities that stagger the imagination. Badly needed electric furnace capacity has been released for other important uses. And Uncle Sam's fighting men are backed up with plenty of ammunition for the hard-hitting gun they swear by—whose stinging power in more than one important action has spelled the difference between defeat and victory.

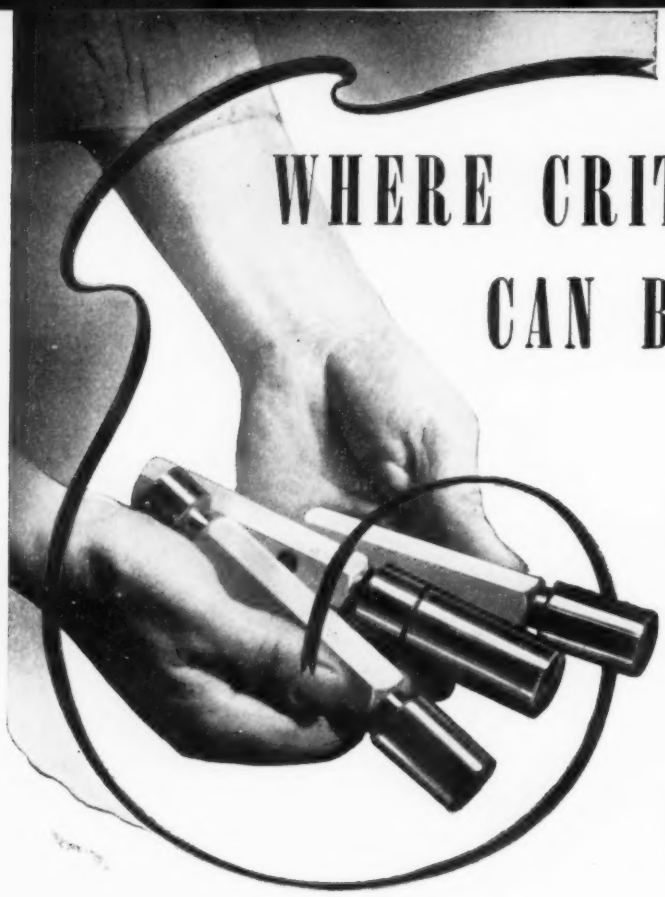
Today a great part of our capacity for Amercut Cold Finished Bars, particularly in high-grade alloys, is required for production of what is admittedly the best .50 cal. bullet-core steel ever produced. Peacetime experience has made it possible to turn out unprecedented tonnages of this superior bar stock. It has high hardenability, consistently uniform quality, and is ready for fast machining. Post-war industry will find that it opens up many new and interesting applications for shock-resisting steels.

AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Export Company, New York

UNITED STATES STEEL



WHERE CRITICAL MATERIALS CAN BE *Conserved*

By The Use Of HARD CHROME PLATING

By The Use Of CARBOLOY CEMENTED-CARBIDE

Wear-resistance in gages can provide the means to save critical materials—used both in the manufacture of the gages themselves and in parts which require extremely accurate inspection.

New gages supplied in hard chrome plate or Carboloy cemented-carbide have much greater life than those made of steel. It is obvious that, by their use, in high production gaging, the amount of steel required for ordinary gages—in quantities which will provide proportionate inspection usefulness—can be used for other purposes. In salvaging worn steel gages by chrome plating, no new steel is required and the life of the gage is increased to approximately five times its original period of service.

Of equal importance, is the increased manufacturing tolerances made possible by the use of wear-resistant gages. Chrome plated and Carboloy gages produced by Lincoln Park can be specified extremely close to required limits. Allowance for wear can be reduced considerably, automatically adding to manufacturing tolerances. This slight extra percentage of tolerance is especially important when parts being inspected are very close to required limits. It eliminates rejections of parts that should be accepted which, in many cases, results in great savings in expensive parts—and the critical materials used in them—and in man and machine hours.

HARD CHROME PLATE—Provides approximately five times the wear-resistance of steel. Lincoln Park—with complete, modern facilities for preparation, plating and finishing — supplies new chrome plated gages and also salvages worn steel gages by plating. A new service is also offered in the salvaging by hard chrome plating of worn surface plates.

CARBOLOY—Provides more than fifty times the wear-resistance of ordinary gages. Lincoln Park pioneered the use of these cemented-carbides in gage manufacture, and for a number of years has been the largest user of Carboloy in the gage industry. A wide variety of gages and non-cutting precision tools of this material are now produced in the Lincoln Park plant.

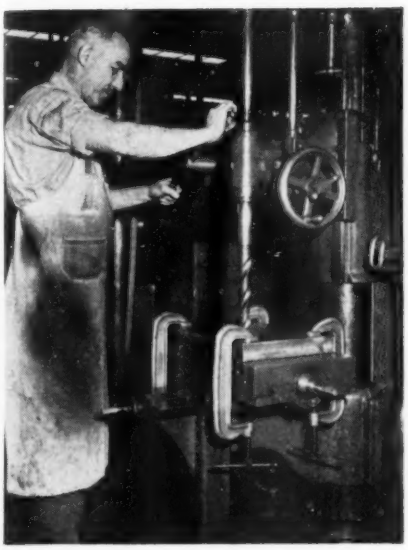
ARMY (E) NAVY

LINCOLN PARK TOOL and GAGE CO.

LINCOLN PARK, MICHIGAN

HOW AND WHY

WILLIAMS' TOOLS AID WAR PRODUCTION



With "C" Clamps now widely used in many phases of war industry and construction, information on the various standard types is timely. Williams' Clamps are all drop-forged from selected steel and heat-treated. Screws are made of special steel, hardened and tempered. A description of the various Williams' patterns, for light, medium, heavy and special duty, follows:

DATA ON WILLIAMS' "C" CLAMPS

WILLIAMS' "AGRIPPA"
for general service

8 sizes, with maximum capacities from 3" to 18". Fitted with drop-forged swivel and screws having sliding pin handle, and threaded U. S. Std.

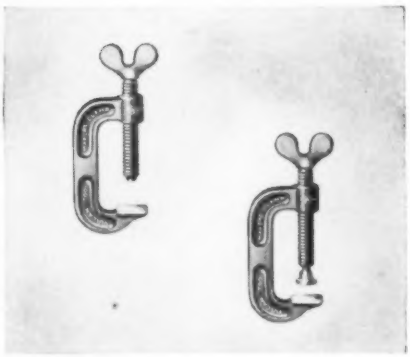
WILLIAMS' "VULCAN"
for heavy service

11 sizes, with maximum capacities from 3/4" to 12-1/2". Long screws can be furnished providing a minimum capacity of 0. Screws threaded U. S. Std.

WILLIAMS' "DEEP THROAT"
for light duty and welding

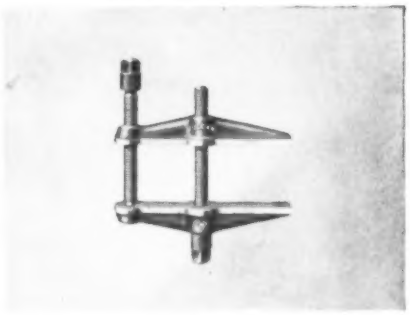
7 sizes, with maximum capacities from 2" to 12". Furnished in two finishes: *Standard* for general service; *Spatter-Resisting* for welding, completely cadmium-plated to resist adherence of welding spatter. Screws have special thread for strength and rapid adjustment.

WILLIAMS' "VULCAN" TOOL-MAKERS CLAMPS



Furnished in 2 types: with plain and with swivel screw. Each type in 4 sizes, with maximum capacities as follows: plain screw, 1" to 4-1/4"; swivel screw, 3/4" to 4". All screws have wings shaped to permit use of lever in tightening. U.S. Std. thread.

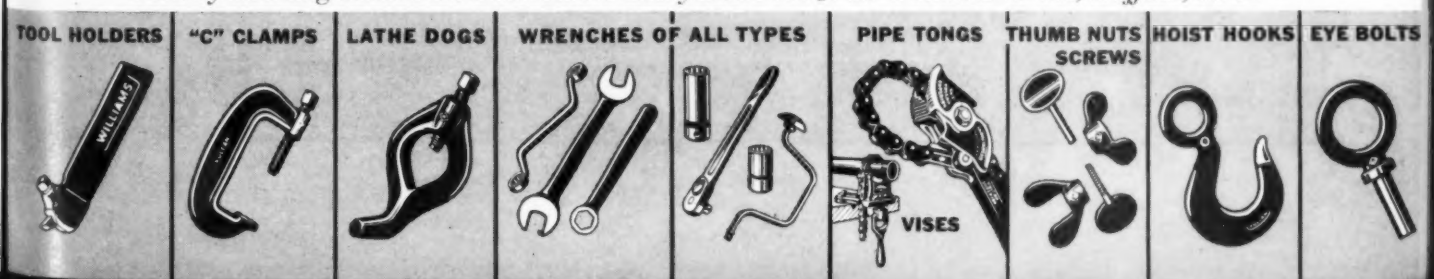
WILLIAMS' "VULCAN" PARALLEL-JAW CLAMP
for Machinists' use



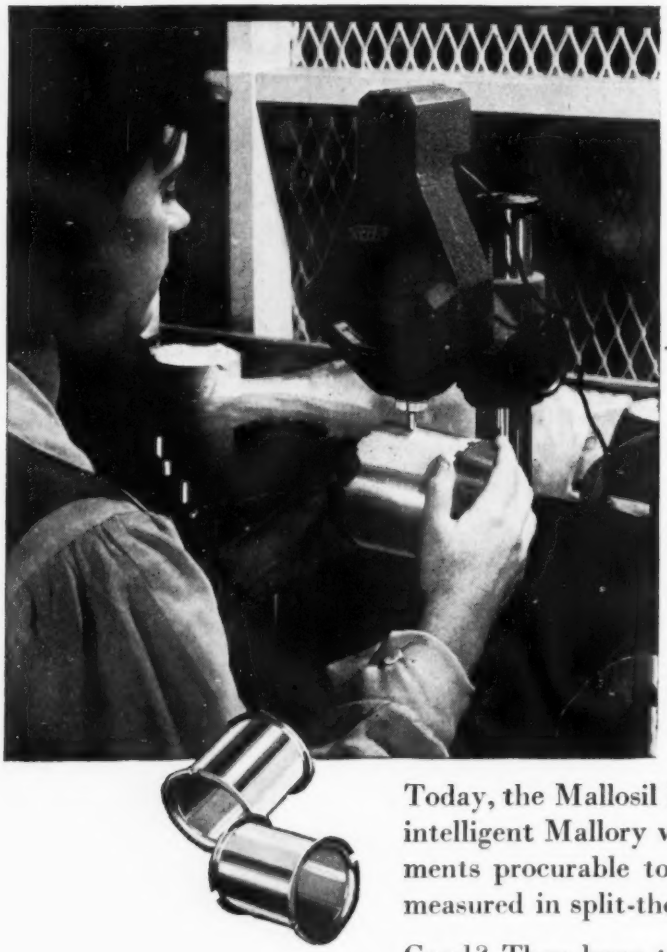
4 sizes, with maximum capacities from 1-1/4" to 4-1/4". Screws threaded U. S. Std.

WILLIAMS
SUPERIOR DROP-FORGED TOOLS
Headquarters
for over half a century for
DROP-FORGINGS and DROP-FORGED TOOLS

Sold by Leading Industrial Distributors Everywhere . . . J. H. Williams & Co., Buffalo, N. Y.



Split-thousandth Bearing Tolerances Mean Split-second Engine Performance Aloft—



Mallory Precision Bearings Provide Them!

Precision keeps pace with production in the output of Mallory Bearings through the Mallosil Process. Top-quality performance is insured by the newest and most accurate high-speed production machinery and specialized testing equipment.

Today, the Mallosil Process is applied to Mallory Bearings by skilled, intelligent Mallory workers, busy guiding the finest tools and instruments procurable to produce uniformity in bearings with tolerances measured in split-thousandths.

Good? They have to be good! Whether they carry engine loads of huge bombers or hard-hitting fighters, Mallory bearings must withstand the terrific poundings and fatigue stresses set up by seven-mile-a-minute speeds . . . and come back for more.

Mallory Bearings . . . made by Mallory's precision Mallosil Process of bonding silver to base metal backings . . . are an important step forward in bearing technique. They are indispensable in war effort; they give promise for a far-reaching future in many directions—in commercial aviation, trucks, buses, machine tools, Diesel-powered equipment, to mention a few.

Constant experimental designing and testing are solving many problems arising from the quest for better performance and the demands of changed requirements. We shall be glad to discuss the possibilities of the Mallosil Process with you.

P. R. MALLORY & CO., Inc., INDIANAPOLIS, INDIANA • *Cable Address*—PELMALLO

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P.R. MALLORY & CO. Inc.
MALLORY

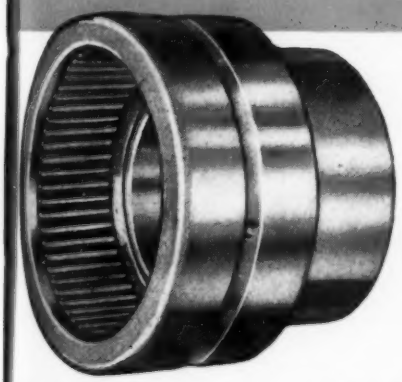
SERVES THE AVIATION, THE AVIATION-INSTRUMENT AND THE AVIATION-COMMUNICATION FIELD WITH WELDING TIPS, THE MALLOSIL PROCESS--BEARINGS, SPECIAL ALLOYS, ELECTRICAL CONTACTS, VIBRATORS, VIBRAPACKS, CONDENSERS, ROTARY AND PUSH BUTTON SWITCHES, ELECTRONIC EQUIPMENT, COMMUNICATIONS HARDWARE, RECTOSTARTERS

Handling Heavy Loads in Small Space!

...a job for P&H ZIP-LIFT

HARNISCHFEGER CORP. MILWAUKEE, WIS.

and ORANGE ROLLER BUSHINGS



THERE are sound reasons why so many leading manufacturers choose Orange Roller Bushings to protect the "tough spots" in their equipment against friction, wear and faulty operation.

First and foremost reason, is the high load-carrying capacity in small space, provided by Orange Roller Bushings. Equally important, is their even, quiet trouble-free operation over long periods of service, resulting from efficient design and precision construction. The outstanding feature of Orange Roller Bushings is their closer running clearances, obtained by holding roller clearances to a minimum through a rigid standardization of size—thus preventing rollers from running tangent to the race. Made in a full range of sizes and types to meet practically all requirements.

In the hook block of each P & H Zip-Lift Hoist, you'll find an Orange Roller Bushing—smoothly, quietly, efficiently carrying loads of 250, 500, 1000 and 2000 pound capacities, according to model. They have been performing with great success since the Harnischfeger Corporation first introduced the P & H Zip-Lift in 1935.

Mail Coupon for Engineering Data

Orange Roller Bearing Co., Inc., A.M.
Orange, N. J.
Please send me your Roller Bushing Data Book

Name..... Title.....

Company.....

Address.....

City..... State.....

ORANGE ROLLER BEARING CO., INC.
ORANGE • NEW JERSEY

ON THE BATTLEFRONT • IN PRODUCTION OF WAR MATERIAL
AND IN INDUSTRY • FEDERAL BEARINGS ARE DOING THE SAME
FINE PRECISION JOB FOR WHICH THEY ARE NOTED • • •
FEDERAL
1308
MADE IN U.S.A.

FEDERAL BEARINGS

TRADE MARK

THE FEDERAL BEARINGS CO., INC.

Makers of Fine Ball Bearings

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Detroit: 2640 Book Tower • Cleveland: 402 Swetland Building

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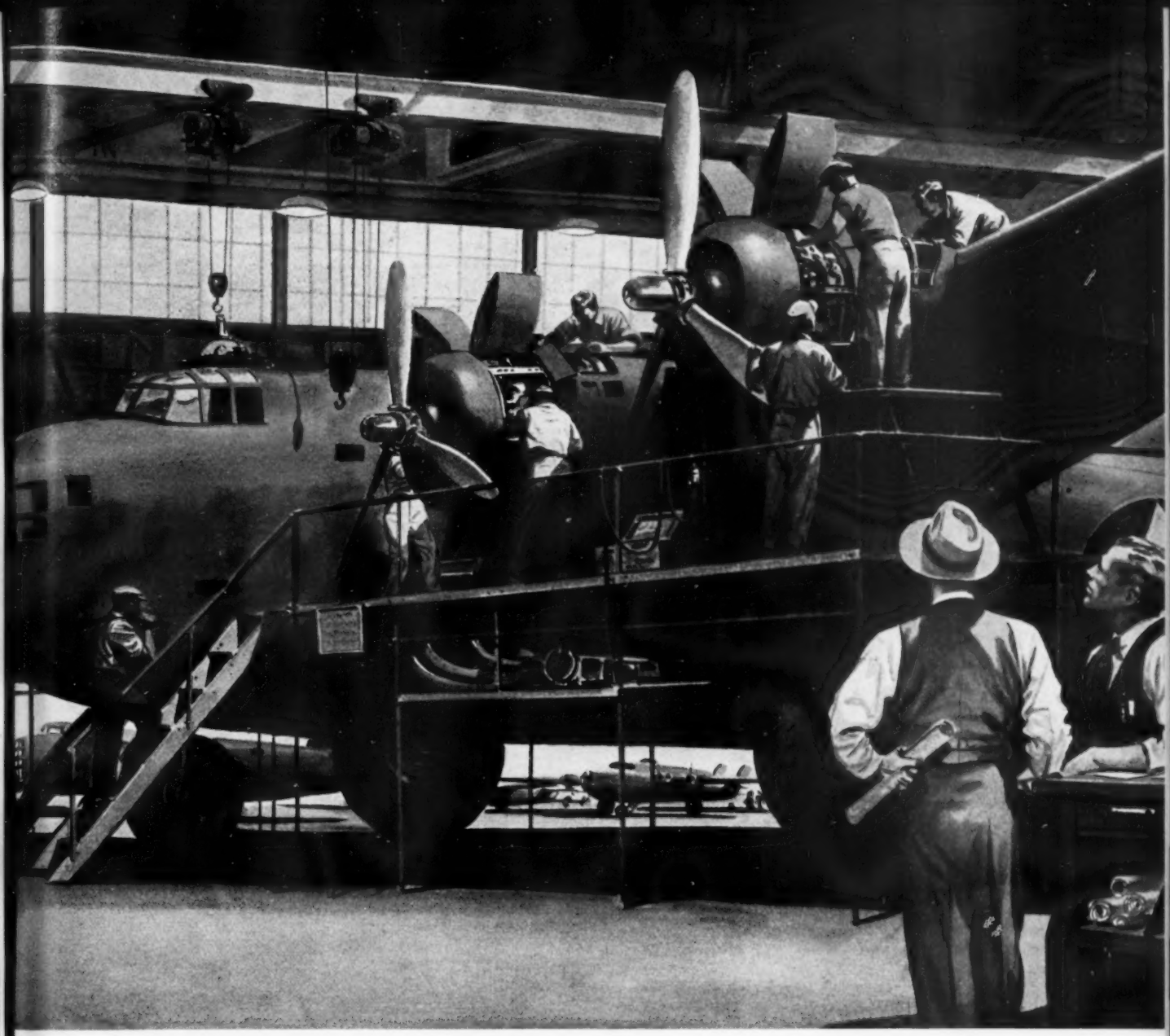


Over 4000 combat planes a month — the staggering production of America's great aviation industry — more evidence of the ability of private enterprise and free men to overcome any odds when Freedom itself hangs in the balance. More and more Howell Motors are being used by the aviation industry and all other vital industries today.

AMERICAN AIR POWER - - -
Howell Motors help build it!

Air power! Air superiority on every front!

That's the goal every aircraft plant in America is driving toward for Victory!

After Victory, American Industry must continue to go forward—must not lose the new momentum of production if the needs of an awakened world are to be fulfilled.

We are, all of us, working and fighting to perpetuate the American way — the only way that will make possible more liberty — a richer, fuller life, more happiness and security for all when Victory is ours.

We're building Howell Motors today just as we've always built them — to the highest standards of quality and precision.

For dependable performance in war work . . . for dependable performance after the war — look into the Howell Idea in Electric Motors.

HOWELL ELECTRIC MOTORS COMPANY

HOWELL • *Manufacturers of Quality Motors Since 1915* • **MICHIGAN**

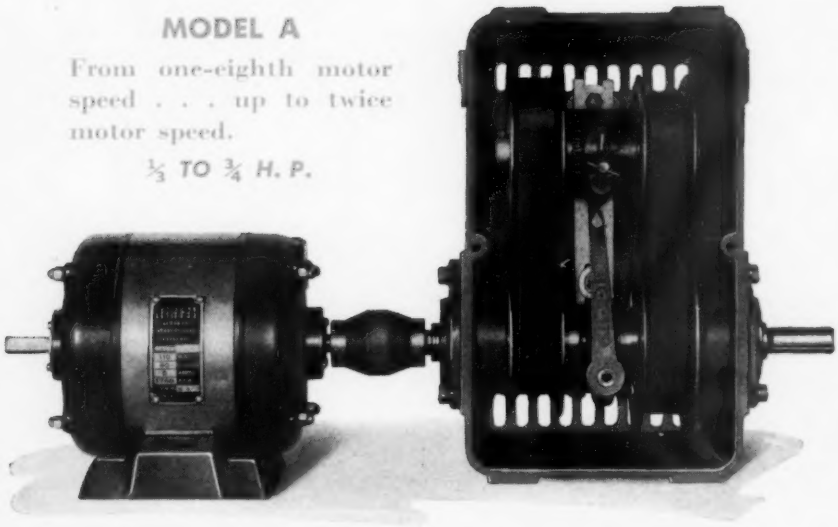
The **HOWELL IDEA**
in Electric Motors
precision-built

THE WORTHINGTON ALLSPEED DRIVE

MODEL A

From one-eighth motor speed . . . up to twice motor speed.

⅓ TO ¾ H. P.



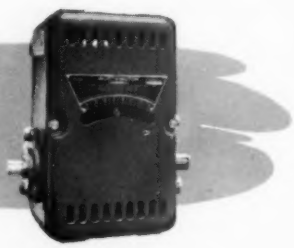
For Fingertip Speed Control

Peak production is obtained when each piece of equipment can be driven at that speed best suited to the efficient working pace of its operator.

With the WORTHINGTON ALLSPEED DRIVE, top-notch workers can produce up to their capacities . . . while beginners can rapidly acquire skill by starting at low speed and stepping-up gradually.

For any equipment within its power range, this readily installed unit provides variable-speed control that is almost magic in its convenience and simplicity.

Write for literature . . . ask for a demonstration of the Worthington Allspeed Drive.



Check ✓

The WORTHINGTON ALLSPEED DRIVE FEATURES

✓ Single-unit construction . . . compact and strong

✓ 16 to 1 speed ratio . . . highest speed ratio in its price range

✓ Positive automatic belt tensioning . . . without springs

✓ Absolute assurance of smooth efficient operation

✓ Can be installed in any position . . . on any machine, new or old

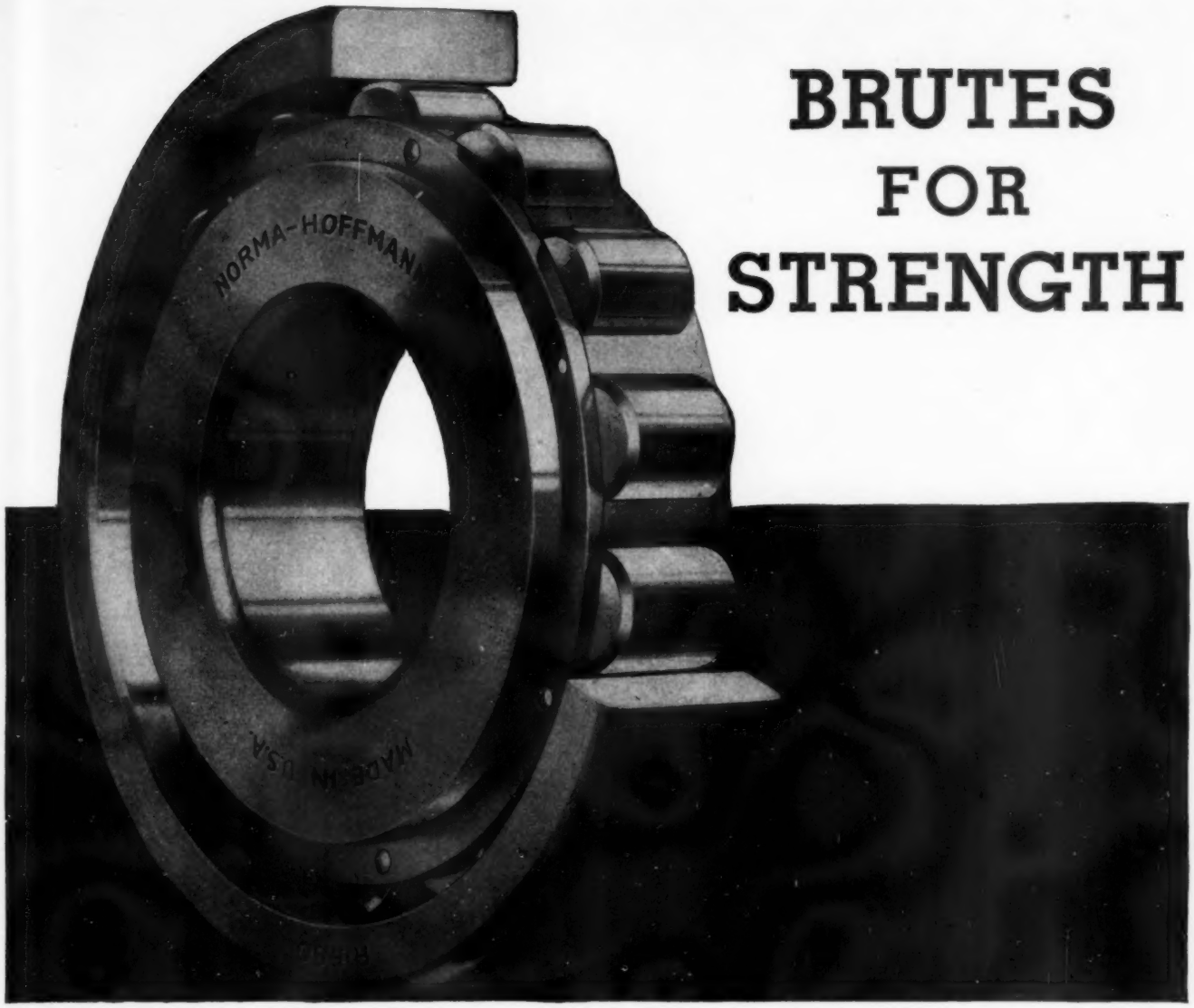
✓ Can be used with any standard motor, 1725 to 1800 r. p. m.

✓ Operates in either direction . . . direct-connected to motor or through V-belt or flat-belt drive

MV3-5

WORTHINGTON

WORTHINGTON PUMP & MACHINERY CORPORATION • GENERAL OFFICES: HARRISON, N. J.



BRUTES FOR STRENGTH

THE outstanding performance records made by NORMA-HOFFMANN PRECISION ROLLER BEARINGS under the heaviest and most exacting duties, are the logical result of the following distinctive factors:

Full line contact of rolling surfaces, affording a larger radial load capacity for continuous and intermittent service than any other type of single-row bearing, and providing a temporary overload capacity 50% above normal catalog rating, with greater resistance to shock and vibration.

Highly durable, completely machined and balanced bronze retainer riding on inner ring shoulders and minimizing internal load.

Lower frictional coefficient under heavy loads than any other single-row anti-friction bearing—due to extreme precision and design characteristics.

Test these PRECISION ROLLER BEARINGS in your own hardest service; remember that they have all the high speed qualities of the best ball bearings, and are interchangeable, size for size, with all single-row metric ball bearings.

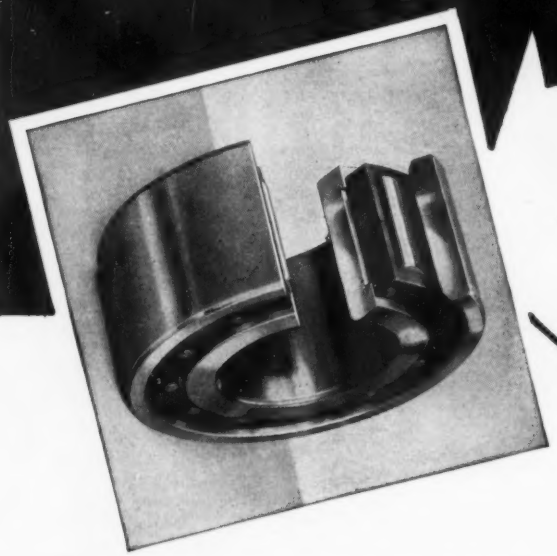
Write for the catalog. Let our engineers work with you.

"NORMA-HOFFMANN"

PRECISION BALL, ROLLER and THRUST BEARINGS

NORMA-HOFFMANN BEARINGS CORPN., STAMFORD, CONN. U.S.A.

Longer Life for Every Bearing *Because:*



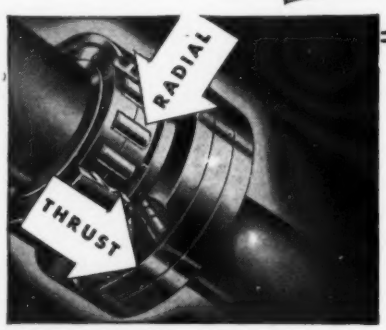
All ROLLWAY RADIAL BEARINGS are Free from Thrust Loads

All ROLLWAY THRUST BEARINGS are Free from Radial Loads

PILE a thrust load on a roller bearing that's already carrying a radial load and you introduce complex stresses that tend to force the rollers from the race . . . that tend to increase sliding friction and wear-back between the roller ends and the radius of the race . . . and that tend to cause earlier fatigue failure.

That's why Rollway Solid-Cylindrical Roller Bearings split every load into its two simplest components of *pure* radial and *pure* thrust . . . carrying each of these on separate roller assemblies at RIGHT ANGLES TO THE ROLLER AXIS. Both torque per bearing and load per roller are substantially reduced. You get greater roller cross-section and greater roller contact area per unit of load, hence more strength to meet stress, and less hazard of spalling and brinelling the race.

You can usually change over from other bearings to Rollways of higher load capacities without increasing boundary dimensions. But, for maximum life and service, your bearings should be carefully chosen as to size and type. Send us your drawings, or a description of your application, for free and confidential bearing recommendation.



For longer bearing life, more efficient performance and more economical maintenance . . .

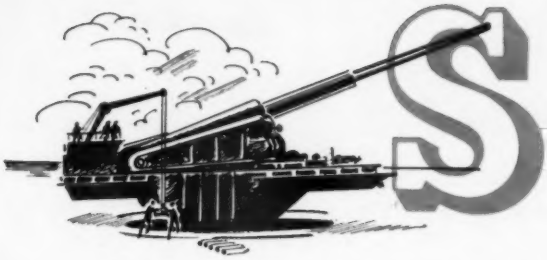
FOLLOW THIS BASIC BEARING PRINCIPLE

- All radial loads carried at right angles to the roller axis.
- All thrust loads carried at right angles to the roller axis.

ROLLWAY BEARING COMPANY, INC., SYRACUSE, N. Y.

BUILDING HEAVY-DUTY BEARINGS SINCE 1908

BEARINGS



SLUGGING POWER

In more than 100,000 industrial plants dependable Dayton V-Belt Drives harness the horsepower on which depends the slugging power of America's flaming steel.

Around the clock, these cool-running Dayton V-Belts transmit smooth-flowing power for every kind of job. They're operating under high speeds and shock loads; they're doing the job in excessive temperatures, and under dust, moisture and abrasive conditions.

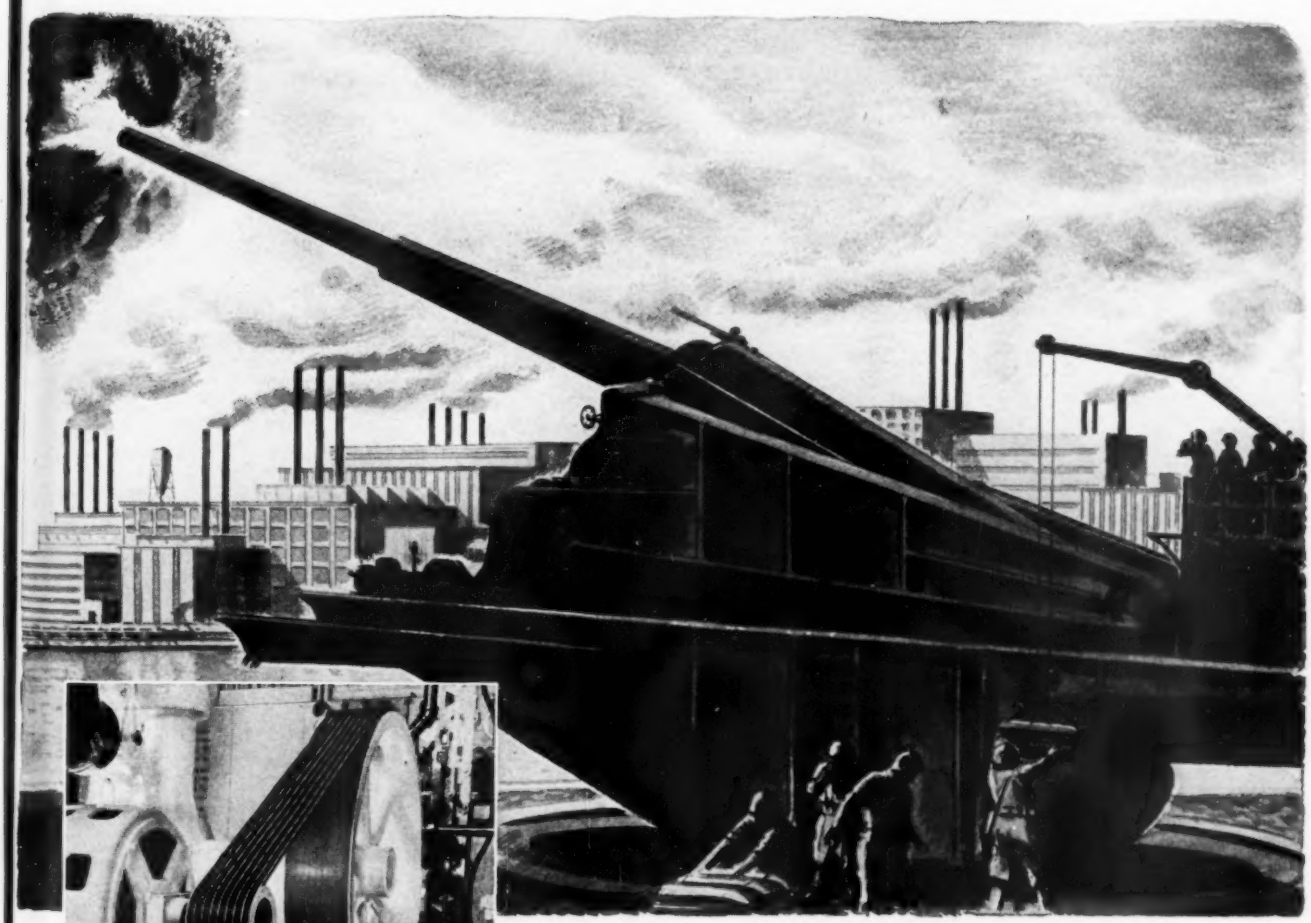
Rugged, long-life Daytons save time, protect machinery, cut power losses and reduce maintenance to a negligible minimum. What's more, these strong, flexible, built-to-bend Dayton V-Belts operate on short centers and permit more output and more machinery per square foot of floor space.

Located nearby to serve your wartime needs is a Dayton Distributor whose stock of V-Belts is supplemented by strategically located factory warehouses. So for service—or for helpful suggestions regarding the conservation of V-Belts through proper application and maintenance procedure—call your nearest Dayton Distributor.

THE DAYTON RUBBER MFG. CO.
The World's Largest Manufacturer of V-Belts
DAYTON, OHIO

DAYTON RUBBER EXPORT CORPORATION
38 Pearl Street, New York, N. Y. U. S. A.

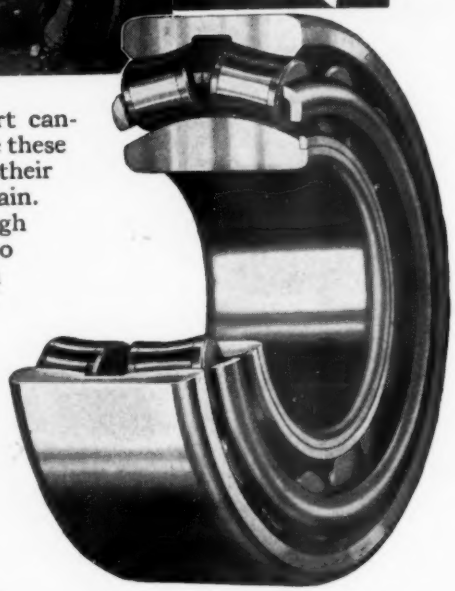
THROW YOUR SCRAP INTO THE FIGHT!
BUY WAR BONDS AND SAVINGS STAMPS



Dayton V Belts
LIFELINES OF POWER VITAL TO VICTORY

THE GREATEST NAME IN V-BELTS

Fighting Friction ON FIGHTING TRUCKS!



● In this "war of movement" transport cannot wait for paved highways. Trucks like these gigantic dual drive Sterlings must take their cargoes unfailingly over any kind of terrain. Jolting over broken ground, slogging through mud or sand, subjects the drive mechanism to every kind of strain and severe loads are thrown on the outer bearings of the driving sprockets. The ingenious design of Sterling's drive unit assures traction even with one wheel completely off the ground, and Link-Belt Friction Fighter roller bearings on the sprocket hubs assure free rolling action with full delivery of power, through Link-Belt Silverlink roller chain, to the rear wheels. These bearings are self-aligning and can handle either radial or thrust loads or any combinations of both. Get Data Book No. 1775 to learn the many unique features of Friction Fighter bearings which are furnished without mountings or as mounted units. Link-Belt Company, Indianapolis, Chicago, Atlanta, Philadelphia, Dallas, San Francisco, Toronto. Branch offices, warehouses and distributors in principal cities.

8909

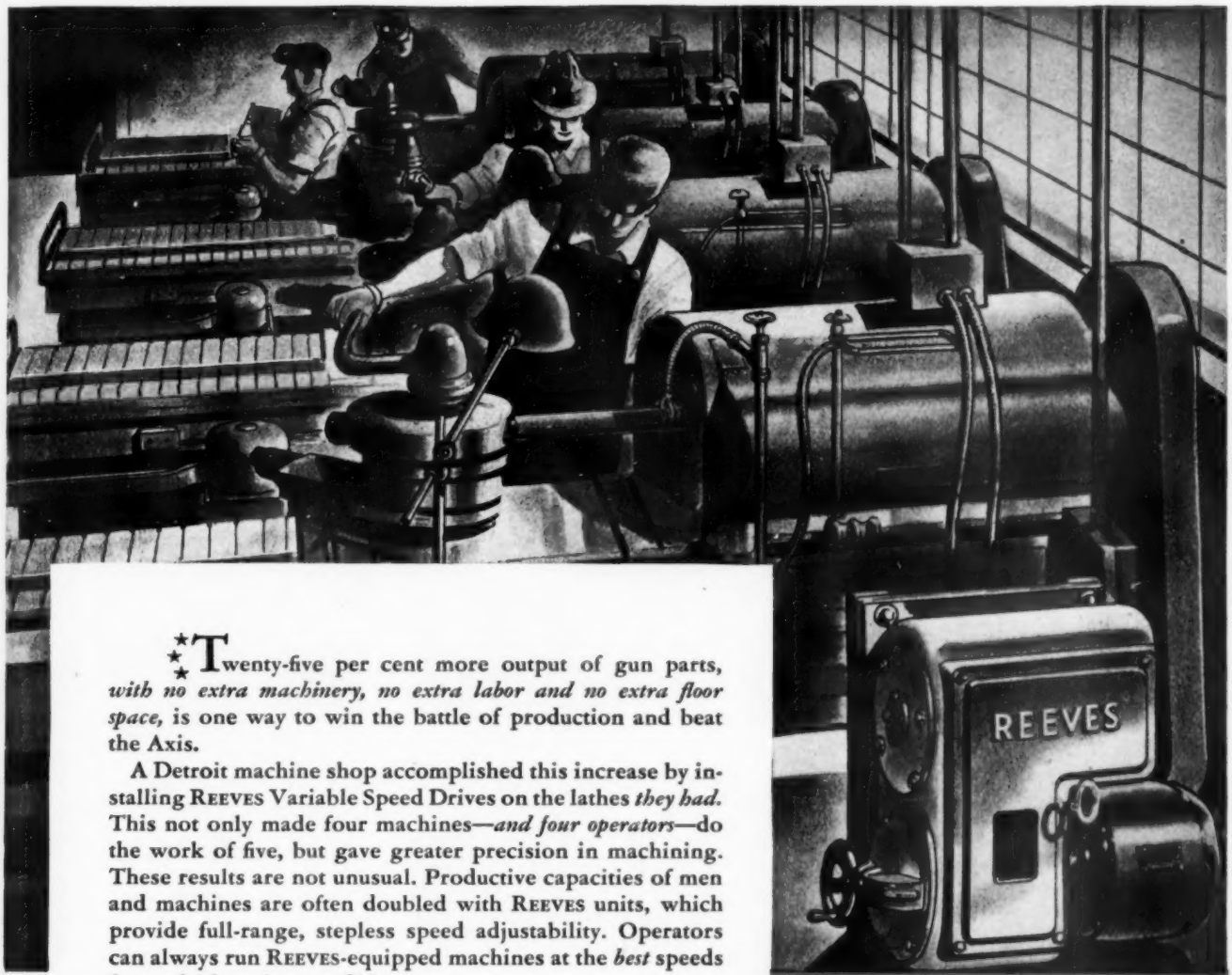
LINK-BELT

FRICTION FIGHTER BEARINGS

Roller and Ball Types

They made 4 machines do the work of 5

by installing REEVES Variable Speed Drives

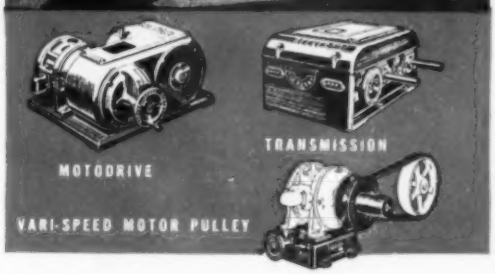


★★★ Twenty-five per cent more output of gun parts, *with no extra machinery, no extra labor and no extra floor space,* is one way to win the battle of production and beat the Axis.

A Detroit machine shop accomplished this increase by installing REEVES Variable Speed Drives on the lathes *they had.* This not only made four machines—*and four operators*—do the work of five, but gave greater precision in machining. These results are not unusual. Productive capacities of men and machines are often doubled with REEVES units, which provide full-range, stepless speed adjustability. Operators can always run REEVES-equipped machines at the *best* speeds for each changing condition.

The faster tempo of the war dictates use to the limit of plants we have *right now*—and REEVES Speed Control, available in many models and sizes, insures increased output and greater accuracy on all types of driven machines *now in service.* Standard on 1,440 different makes of new machines. Booklet AG-423 tells the story. Write for it.

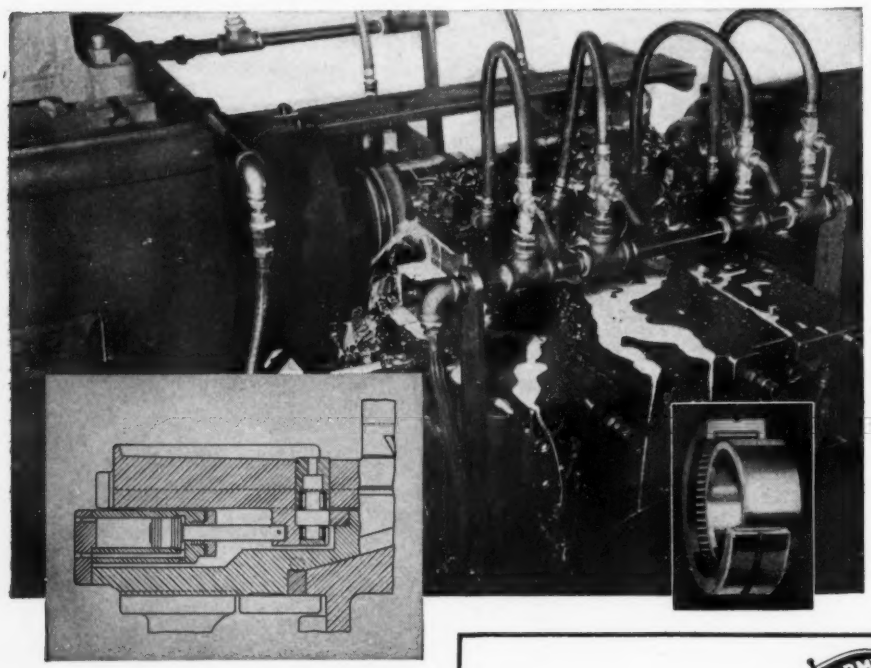
REEVES PULLEY COMPANY • COLUMBUS, INDIANA



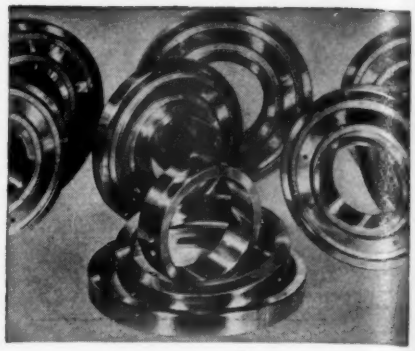
REEVES *Accurate Variable* SPEED CONTROL

IN THE NEWS
WITH BANTAM BEARINGS

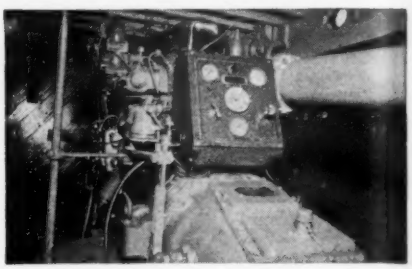
TO SPEED THE ANNEALING of iron alloys, these furnaces built by Continental Industrial Engineers, Inc., are designed for rapid handling of the work. Metal to be heat treated glides smoothly into the furnace on easy-turning rollers. As shown in cross-section, each roller turns on an anti-friction bearing unit assembled from Bantam Needle Rollers. A hardened sleeve, also furnished by Bantam, forms the outer raceway.



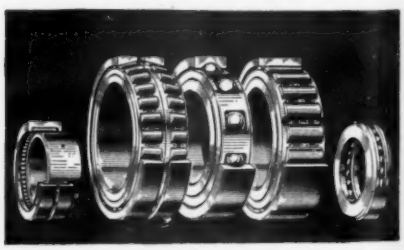
IN MACHINE TOOLS, the Quill Bearing's small size, high capacity, low friction coefficient, and efficient lubrication make it possible to combine long life, low power consumption, and compact product design. A typical instance is the use of Quill Bearings on the front carriage assembly of Semi-Automatic Shell Lathes built by Morey Machinery Co., Inc. For further details on this unusual anti-friction bearing unit, write for Bulletin Q-104.



DESIGN OF SPECIAL BEARINGS is an important aspect of Bantam's service in meeting unusual requirements. These triple-race radial ball bearings were designed to eliminate starting friction in dynamometers, where this variable factor would seriously affect the accuracy of the test results. Very close dimensional tolerances were maintained in these bearings as an added assurance of accurate results.



IN MARINE APPLICATIONS TOO, Bantam Bearings play their part in improving product performance. Twin Disc Clutch Company uses Bantam Bearings for the throwout bearing on its widely used Marine Reverse and Reduction Gears, one of which is shown here on a 215-HP engine.



WHEN LARGE-SIZE BEARINGS ARE NEEDED, Bantam's experience in the design and manufacture of heavy-duty bearings is of special value. Bantam's line includes every major type of anti-friction bearing—in sizes up to the largest ever built. If you have a problem involving exceptionally severe bearing requirements, TURN TO BANTAM.

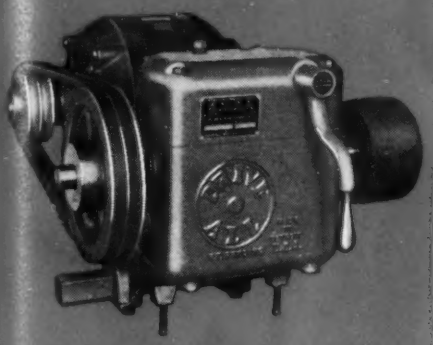
ARMY E NAVY

BANTAM BEARINGS

STRAIGHT ROLLER · TAPERED ROLLER · NEEDLE · BALL

BANTAM BEARINGS CORPORATION · SOUTH BEND · INDIANA

SUBSIDIARY OF THE TORRINGTON COMPANY · TORRINGTON, CONN.



DRIVE-ALL
Selective Speed
TRANSMISSIONS
for

BORING MILLS

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SPECIAL APPLICATIONS

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GEAR CUTTERS

MILLING MACHINES

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SHAPERS AND PLANERS

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- Positive Power
- Faster Speeds
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- Heavier Feeds
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Chicago, Ill.	30 N. LaSalle St.	Randolph 6576
Milwaukee, Wis.	743 N. Fourth St.	Broadway 2282
Racine, Wis.	837 Lake Ave.	Prospect 987
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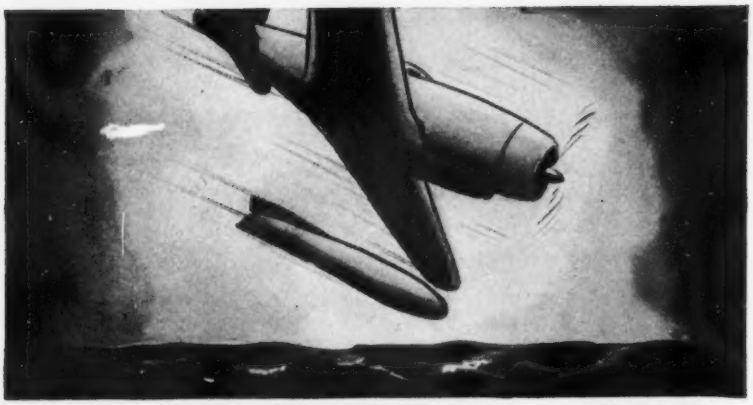
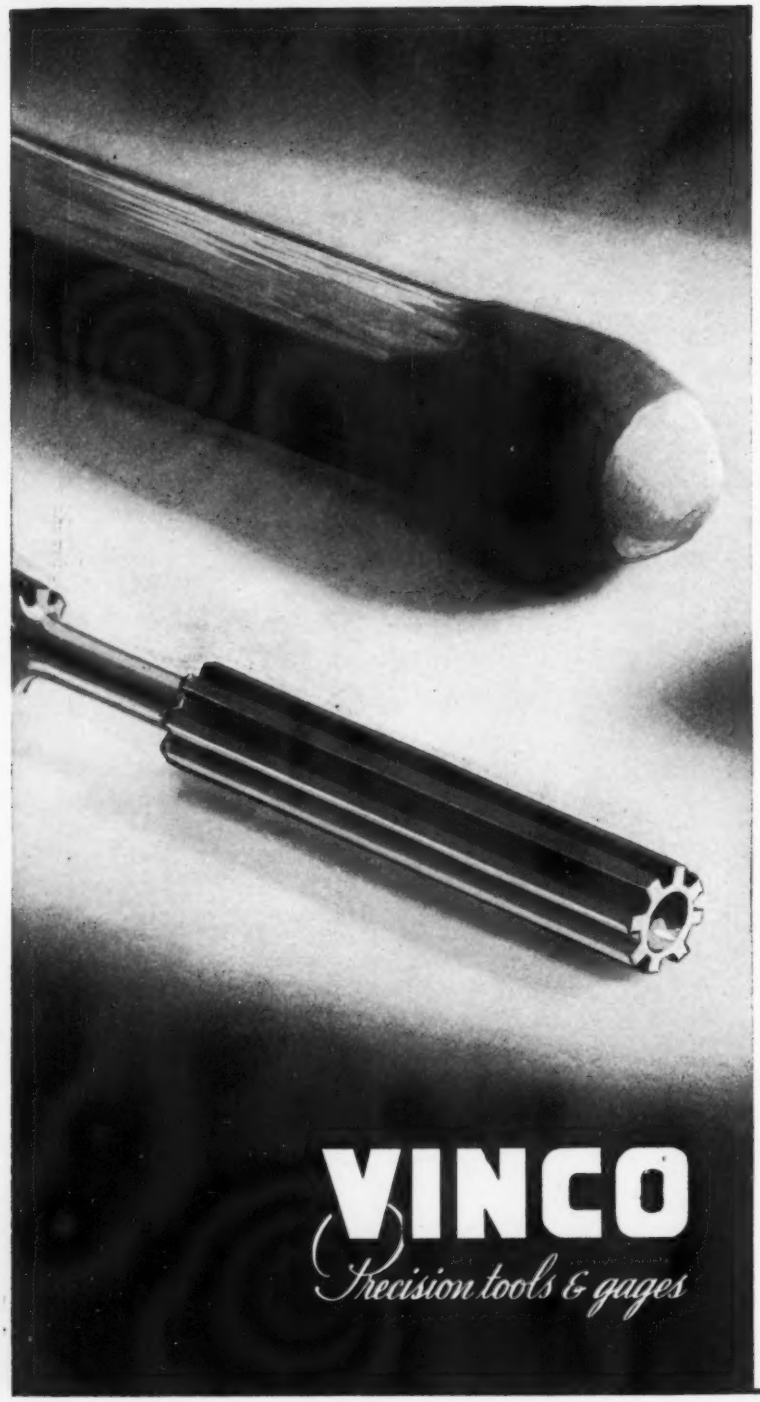
Ask for New Catalog

DRIVE-ALL MANUFACTURING COMPANY

3400 Conner Avenue ★ Detroit, Michigan



DWARFED BY A MATCH!



A low-flying plane, aiming itself at an enemy cruiser—a lever pulled and a long, sleek torpedo drops into the water and rushes destruction toward the enemy.

But all must be right with the big tin fish!—the motor running smoothly and the fuse already for the smash into the side of the ship. Tiny mechanisms, more accurately made than any watch part, assure the success of the attack.

VINCO accuracy in the manufacture of fixed limit checking devices, is well known throughout the long list of war producers. For example, the gage at the left has proven accuracy of less than .0001 error, yet is smaller than a match stick. Parts checked with gages as accurately made as this, must operate smoothly and surely.

From a weight of an ounce to a weight of many pounds, VINCO gages all have the same VINCO accuracy.

If you have a gaging problem, VINCO can help you.

VINCO CORPORATION

8851 SCHAEFER HIGHWAY
DETROIT • • MICHIGAN

The Versatile, LIGHT ABRASIVE for *Faster:*

De-burring ★ Cleaning ★ Finishing ★ Polishing

WELDON ROBERTS

Brightboy

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ALCLAD "STAINLESS" BRASS ALUMINUM PLASTICS

SILVER COPPER QUARTZ CRYSTALS MONEL DURAL

and for smoothing up welded and soldered joints

—WITH MINIMUM DIMENSIONAL LOSS!

Brightboy is distinguished from other abrasives by a fundamental difference: *THE SOFT RUBBER BINDER.*

THIS unique and original characteristic of Brightboy gives a *resilient abrasive action* which has been extensively utilized in America's war industries. Brightboy's *soft rubber* binder *cushions* the abrasive. In operation the abrasive *recedes* into the resilient rubber, falling free as the rubber binder is worn away.

The surface finish secured with Brightboy is a smooth, precision job and, generally, serves as the final polish. Brightboy bridges the gap between a grind and a buff—reducing operations and minimizing dimensional loss.

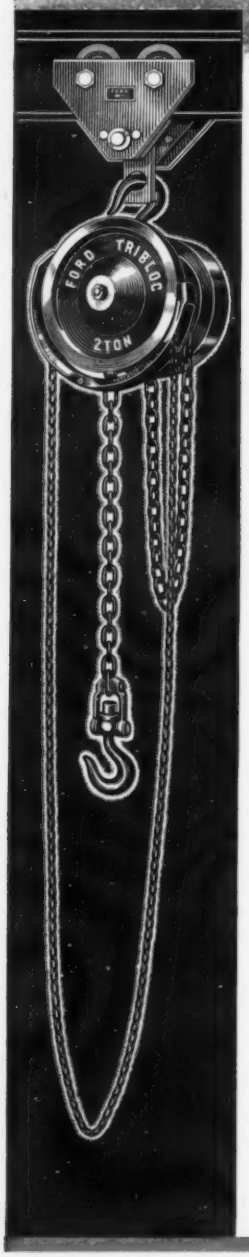
- ★ NO SPECIAL TRAINING NECESSARY
- ★ ANY WORKER CAN USE BRIGHTBOY
- ★ NO SPECIAL SETUPS REQUIRED
- ★ READY FOR IMMEDIATE USE
- ★ SERVICEABLE DOWN TO THE LAST SMALL PIECE

Made in wheels, blocks, sticks, rods and special shapes for manual and machine operations. Ask your dealer for catalogs and prices. Write us if he cannot supply you. Our service representative will be glad to call.

BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO.
Newark, N. J., U. S. A.

Grease your Ford Tribloc

. . . AND YOU GREASE THE SKIDS FOR THE AXIS



FORD TRIBLOCS withstand abuse amazingly well—but this is certainly no time to abuse anything made of critical materials. Like any other precision-made machine, **FORD HOISTS** will give more efficient service for a longer time if properly maintained. In **FORD HOIST** maintenance, lubrication is perhaps the most important single factor—so here are a few pointers on lubricating **FORD TRIBLOCS.**

- The gear cover should be removed occasionally and a small quantity of suitable graphite grease applied.
- The load chain should be lubricated frequently with a heavy oil, particularly at engaging points of links.
- Load sheaves should also be greased.
- Oil the bearings frequently so that no bearing will run dry and cause excessive wear.
- Oil holes are provided in the **TRIBLOC** at vital points. These should be used frequently.

When given intelligent care, lubricated thoroughly at intervals, **FORD TRIBLOCS** will remain efficient under the hardest usage for a long time. Your **FORD HOIST** can be one of your best friends during this production emergency. Take care of it.

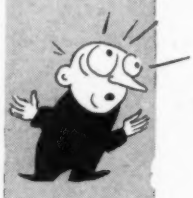
FORD CHAIN BLOCK DIVISION

PHILADELPHIA • CHICAGO
SAN FRANCISCO

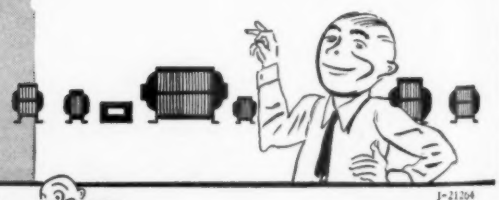
AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT, CONNECTICUT

Specialty Transformers for the circuit problem that *wracks your brain*

can probably be assembled by Westinghouse from the *standard parts*



that are used in the *large variety* of specialty transformers built by (W)

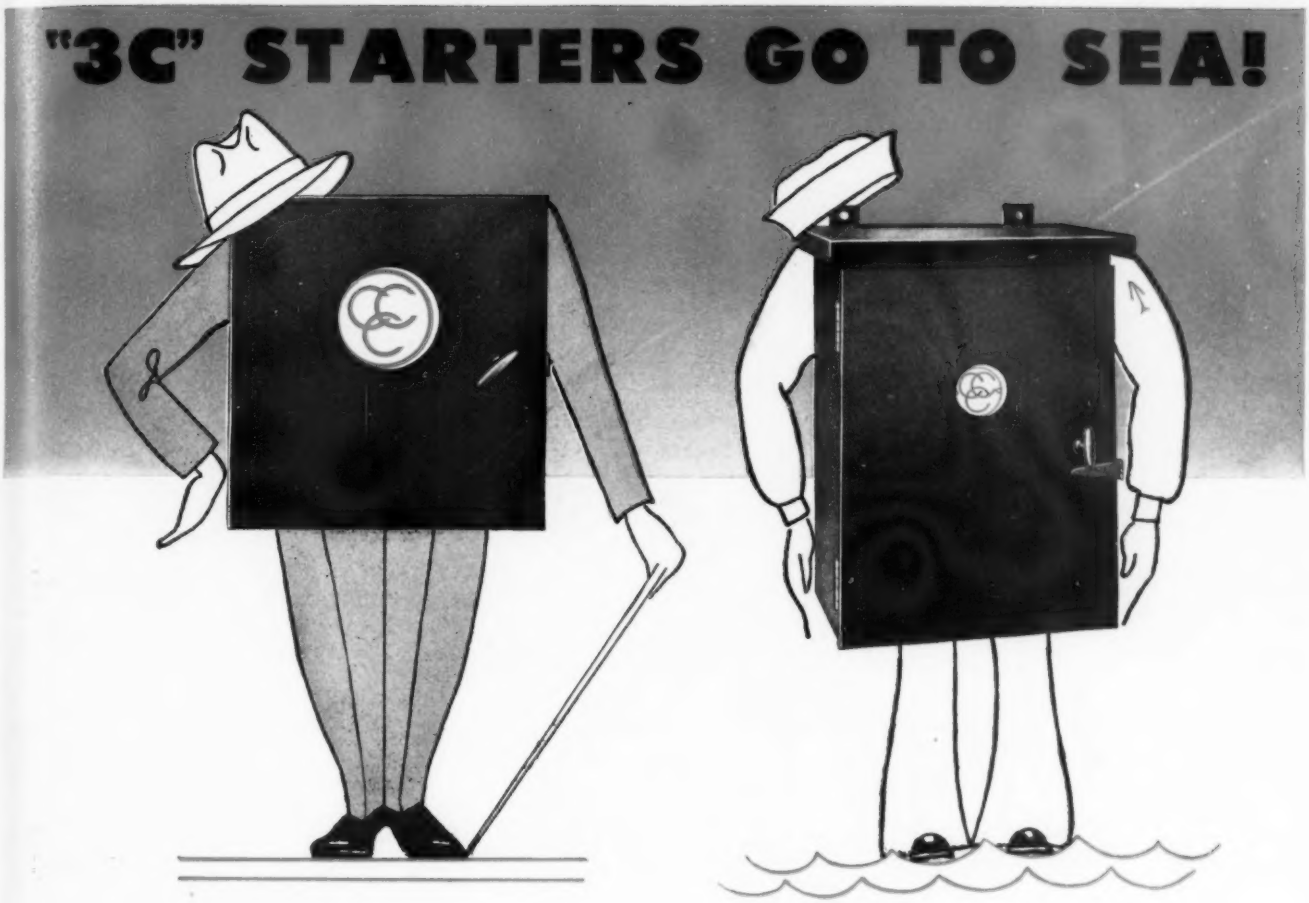


J-21264

Westinghouse
MT TRANSFORMERS

DEPT. 7N, WESTINGHOUSE ELECTRIC & MFG. CO., EAST PITTSBURGH, PA.

"3C" STARTERS GO TO SEA!



Clark Bulletin 5370 D. C. Heavy Duty Automatic Starters, long standard in Steel Mill and heavy Industrial applications, are now adapted to life on the Ocean Wave. Just a few changes, and "3C" apparatus goes to sea!

STANDARD FEATURES		OCEAN GOING FEATURES
Dust Proof Enclosing Cabinet	◄——►	Drip Proof Enclosure
Overload Protection	◄——►	Overload Protection
Standard Finished Parts	◄——►	Corrosion Resisting Parts
Bul. 7400 DC Contactors	◄——►	Bul. 7400 DC Contactors counterweighted to prevent accidental opening or closing when ship is in high seas.
Control circuit fuses optional	◄——►	Control circuit fuses standard
Monson slate mounting	◄——►	Ebony Asbestos mounting
Bul. 110 or 113 Starting Resistors	◄——►	Bul. 110 or 113 Starting Resistors
No Disconnect Switch	◄——►	Disconnect Switch optional

"3C" Control is available for various deck auxiliary equipment as well as Bul. 5370 motor starters.

CONTINUE TO ROLL WITH CLARK CONTROL

THE CLARK CONTROLLER CO.

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With this Amazing TRIG-EASY CHART every man whose work requires a solution of problems involving angles can save his time and time for those who must wait for calculation — and eliminate all errors through use of wrong equations.

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(without knowledge of higher mathematics)

You have 40 Trigonometric Equations at your finger-tips. TRIG-EASY pays for itself every time it is used. It is a handy vest or shirt pocket size, grease-proof and sturdy to resist moisture and dirt.

Send only 50c for your TRIG-EASY with complete instructions and MONEY-BACK GUARANTEE.

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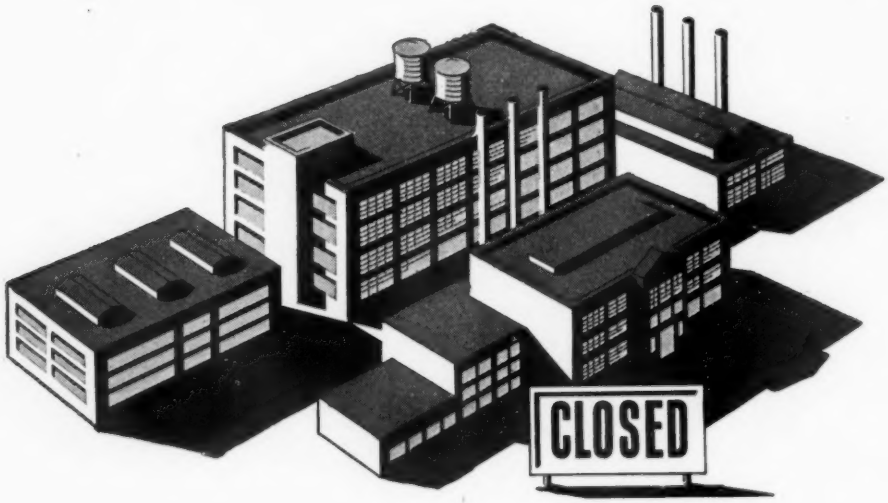
FOR WANT OF A "Part"...
A PLANT WAS CLOSED



EXCEPT for one difficult part, your new product or your present war production may be all set. Failure to procure that one part may block an otherwise successful program . . . might even close your plant!

If a problem of this type is bothering you...if it involves redesigning for use or production...if you are not fully equipped to make it...KAYDON can manufacture it for you, on a production basis, with unfailing precision and assured delivery.

Contact KAYDON

The KAYDON organization welcomes such problems . . . is qualified to cooperate with your organization in putting your plans into *action!*

If the need for difficult parts is retarding your war production or development of your post-war products, KAYDON offers precision facilities *plus* a broad background of manufacturing and technical experience.

THE KAYDON ENGINEERING CORP.

McCRACKEN STREET • MUSKEGON, MICH.

Specialists in Difficult Manufacturing

Until Victory—

Today—and until Victory—Ceco Automatic Universal Precision Screw Machines are turning out a wide variety of small, accurately finished parts for famed makers of aircraft and other military precision instruments, controls and accessories. So it is that Ceco Automatics are proudly helping to produce, economically and at high speed, the extremely accurate precision parts for instruments which give sight, sound or slugging power to America's brave and avenging young sky fighters. And until Victory is won, we would not have it otherwise. Nor would you.

AFTER VICTORY—

Ceco Automatics will serve the makers of instruments, controls, appliances and devices which will bring to a post war world a new era of comfort and efficiency.

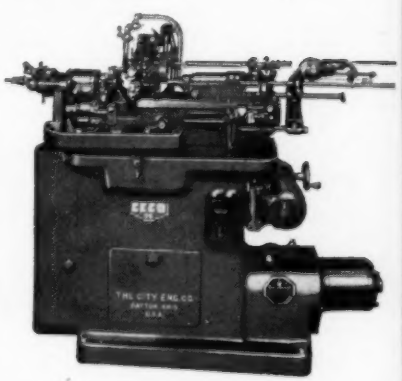
CECO'S OUTSTANDING ADVANTAGES

EXTREME ACCURACY. Ceco holds tolerances to .0003".

PROVED ECONOMY. In many cases Ceco produces a finished piece from bar stock without a second operation for finish and tolerance.

HIGH SPEED. Ceco has a Master Speed Ranger which gives from 680 to 7500 R.P.M. spindle speed by the turn of a handwheel. No changing gears, belts or pulleys. Ceco's Cam Shaft has a range of from 3 seconds to 8 minutes. No gears to change.

SIMPLICITY. Ceco's Precision Roller Bearing Spindle is always in adjustment. Operates at faster speed and runs cool at high speed. Ceco's Constant Rise feeding mechanism gives more accurate feeding.



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SWISS TYPE *Automatic*

UNIVERSAL PRECISION SCREW MACHINES

Engineered and Manufactured by
THE CITY ENGINEERING COMPANY
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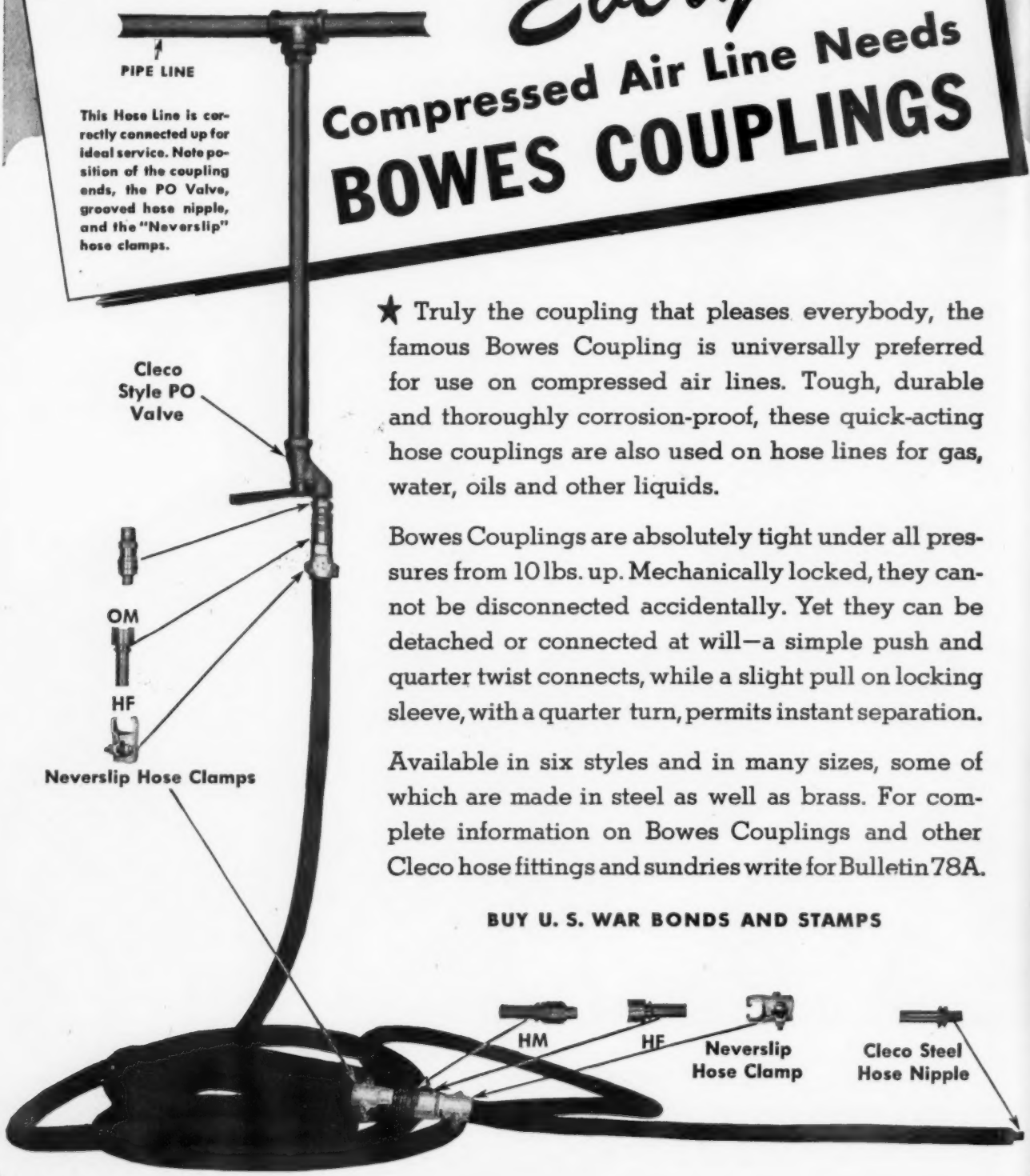
Since 1909, Designers and Builders of Tools, Dies, Fixtures and Special Purpose Machinery.

Every Compressed Air Line Needs BOWES COUPLINGS


PIPE LINE
This Hose Line is correctly connected up for ideal service. Note position of the coupling ends, the PO Valve, grooved hose nipple, and the "Neverslip" hose clamps.
Cleco Style PO Valve
OM
HF
Neverslip Hose Clamps
HM
HF
Neverslip Hose Clamp
Cleco Steel Hose Nipple

★ Truly the coupling that pleases everybody, the famous Bowes Coupling is universally preferred for use on compressed air lines. Tough, durable and thoroughly corrosion-proof, these quick-acting hose couplings are also used on hose lines for gas, water, oils and other liquids.

Bowes Couplings are absolutely tight under all pressures from 10 lbs. up. Mechanically locked, they cannot be disconnected accidentally. Yet they can be detached or connected at will—a simple push and quarter twist connects, while a slight pull on locking sleeve, with a quarter turn, permits instant separation.

Available in six styles and in many sizes, some of which are made in steel as well as brass. For complete information on Bowes Couplings and other Cleco hose fittings and sundries write for Bulletin 78A.

BUY U. S. WAR BONDS AND STAMPS

THE CLEVELAND PNEUMATIC TOOL CO.

3781 EAST 77th ST. — *Branch Offices in All Principal Cities* — CLEVELAND, OHIO

★

Know-How

TO BUILD BIG MACHINES WITH GREAT ACCURACY

● Tank production requirements in a large War Plant today are handled efficiently and rapidly by this Defiance Mill . . . built oversize for added strength and rigidity.

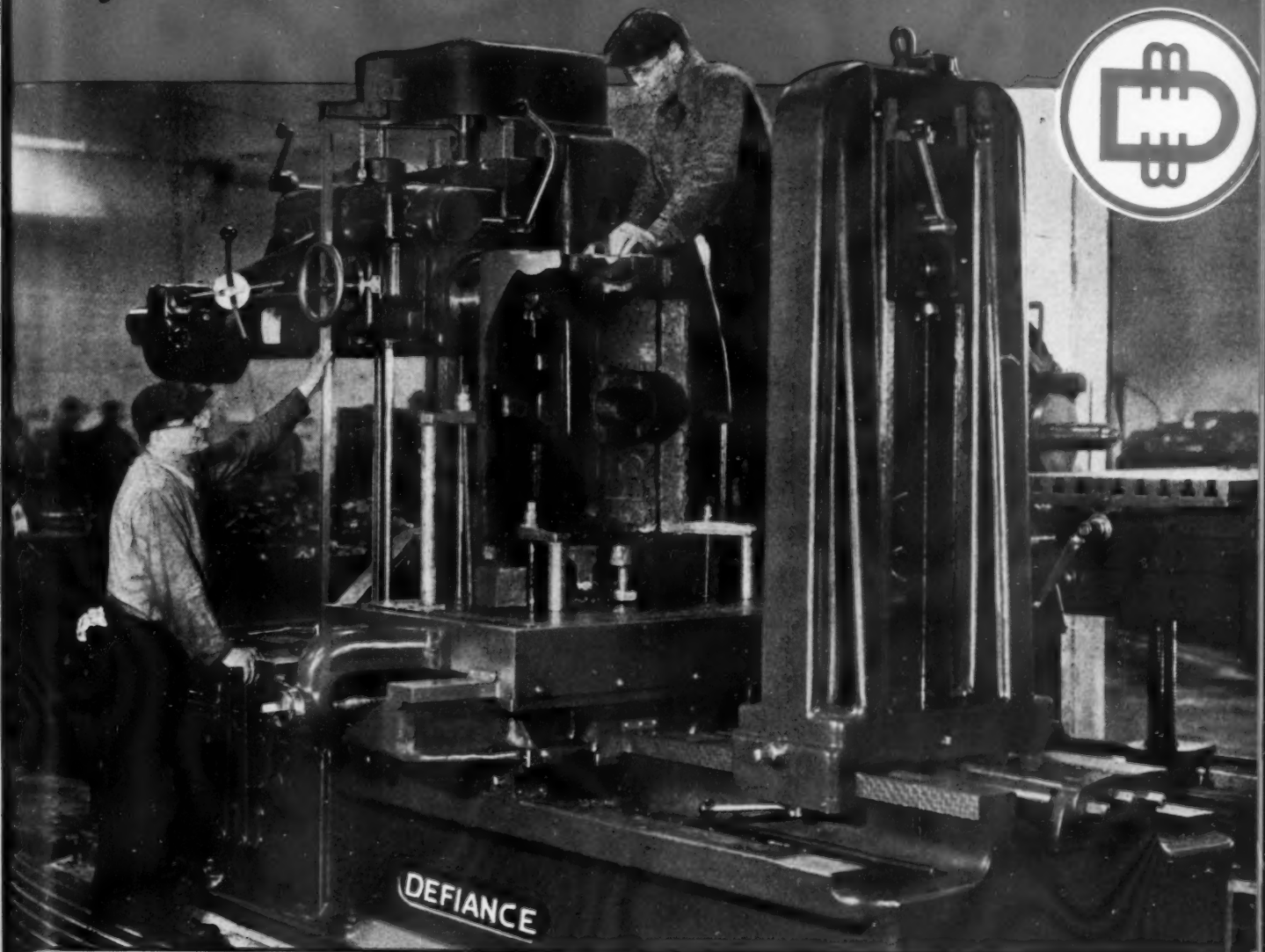
Long experience in designing and building *big* machines *right* helps Defiance find the practical answer to toughest problems *pronto!*

A typical example of Defiance *simplicity, accuracy* and *ruggedness* is found in Model 25 shown here. Its fifteen outstanding features include (1) only horizontal boring mill having outboard bearings an integral part of machine . . . no worry as to accuracy of supports; (2) adjustment for outboard bearings makes for permanent accuracy; (3) wide range of speeds on main spindle. See our insert in Sweet's Mechanical Catalog or write us.

Defiance Machine Works, Inc., Defiance, Ohio.

Makers of Precision Machinery Since 1850

Horizontal **BORING . . MILLING . . DRILLING . . TAPPING** *Machines*



DEFIANCE

NO PLACE FOR "Doubtful Screws"

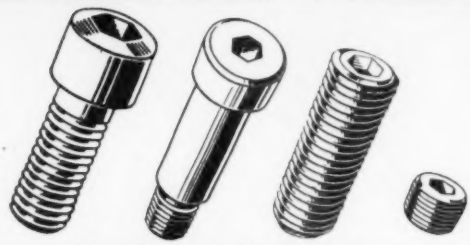
Photo by U. S. Army Signal Corps.

. . in the Mechanical "Brains" of our Fighting Forces . . .

With their own unaided senses, our fighting men could never win a modern war. Precision instruments are their mechanical "brains" . . . searchlights "see" the invisible enemy . . . sound locaters "hear" him hundreds of miles away.

Because it must withstand the gruelling strains of war service . . . because it must not fail in the field . . . this vital equipment can include no "doubtful" materials. The smallest detail must be as nearly perfect as human skill can devise. That is why Parker-Kalon Quality-Controlled Socket Screws are "on the preferred list" of many manufacturers of important war aids.

The unparalleled check-routine supervised by the Parker-Kalon Quality-Control laboratory eliminates the "doubtful screws" . . . screws that *look* all right but fail to *work* right. You can be *sure* of the physical and mechanical characteristics of P-K Socket Screws . . . yet they cost no more! Parker-Kalon Corporation, 194-196 Varick Street, New York, N. Y.



"Quality-Controlled means . . .

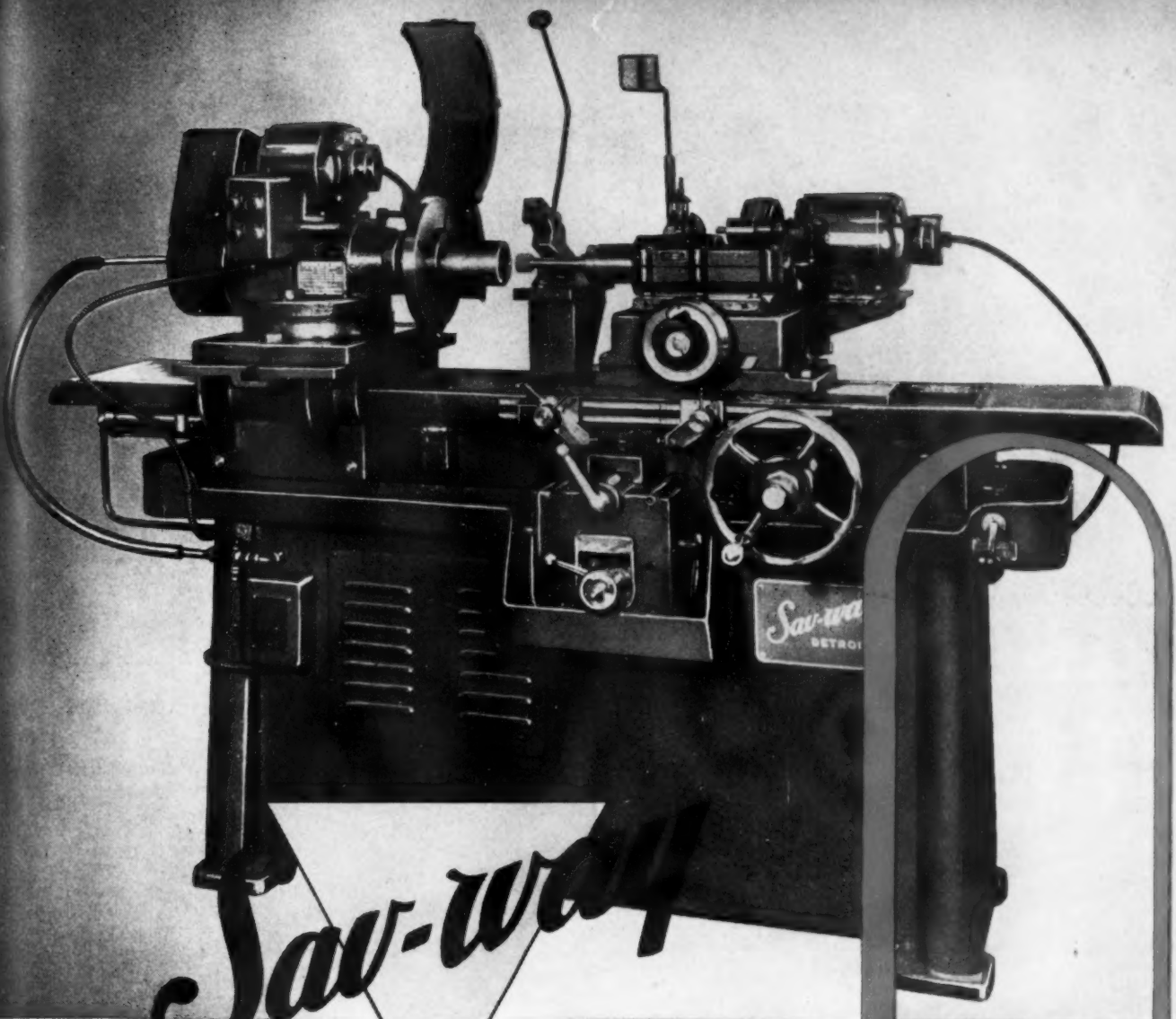
Complete test and inspection covering: Chemical Analysis; Tensile and Torsional Strength; Ductility; Shock Resistance under Tension and Shear; Hardness; Head diameter, height and concentricity; Socket shape, size, depth, and centricality; and Thread fit.

PARKER-KALON

Quality-Controlled

SOCKET SCREWS

Give the Green Light to War Assemblies



Sav-way

MODEL M-H-2

INTERNAL GRINDER

With Both

POWER and HAND FEED

One easy move of lever gives operator the choice of either hand or power feed, and neither one is dependent on the other . . . this permits top speed power grinding for diameter, and an instant switch-over to hand operation for close decimal depth grinding when desired . . . finishes the job with one set-up in place of two, and eliminates possibility of "run-outs" . . . one Sav-way model MH2 actually will do the work which formerly required two machines to do.

Send for "Bulletin MH2" which gives complete specifications.

Shift lever pushed in and feed engaged for operation of machine manually; power feed is now disengaged.

Shift lever pulled out and feed engaged for operation of machine by power; hand feed is now disengaged.

Sav-way INDUSTRIES
★ Machine Tool Division ★
4873 EAST EIGHT MILE · DETROIT, MICHIGAN

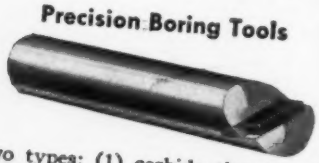
Over 300 CARBOLOY (TRADE MARK) ★ CEMENTED CARBIDE STANDARDS*

For War Production

*Standard Stock TOOLS AND BLANKS

Standard stock items are tools and blanks manufactured in mass production and are therefore lower in price and more readily available than tools or blanks made only upon receipt of order. Large number of items are now in this standard stock classification. Of particular importance to war plants are the standard tools shown below at right. To meet rush needs, many plants keep active stocks of these and quickly grind special shapes as needed.

Precision Boring Tools



Two types: (1) carbide tipped (with flat top or back rake) sizes $\frac{5}{16}$" through $\frac{1}{2}$" dia. (2) solid carbide $\frac{3}{32}$" through $\frac{1}{4}$" dia.

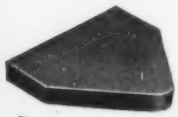
Lathe and Grinder Centers

(Up to 50 times longer life than steel.)

Carbide tips only.

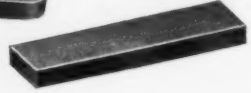
Finished tipped centers (with Morse, B & S, and Jarno Tapers).

Special-Purpose Standard Stock Carboloy Cemented Carbide Blanks



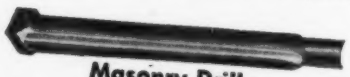
Scraper Blanks for 4 hand scraper sizes

Pointed Nose Blanks



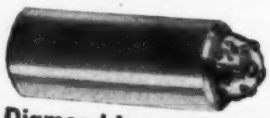
Reamer Blanks 11 Standard Sizes

Pointed nose blanks have 80° included angle. For pulley grooving and general purpose turning.



Masonry Drills

Drills concrete, brick, etc. 75% faster than old methods. Use in portable electric drills or hand braces. Speeds up installation of wiring, piping, machinery, etc. Sizes $\frac{3}{16}$ to $1\frac{1}{2}$.



Diamond-Impregnated Grinding Wheel Dressers

Contains large number of sharp diamond particles permanently embedded in carbide matrix. Eliminates remountings. Saves 25% in annual dresser costs. 3 sizes. For all grinding wheels.

General-Purpose Standard Carboloy Blanks

Style 100 Style 200

For emergency tooling, braze Carboloy blanks to your own shanks. More than 100 standard blanks available. Sizes $\frac{1}{16}$" to $\frac{1}{2}$" thick.

Ammunition Dies

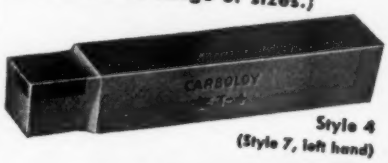
(Catalog D-113-R)

.30 and .50 cal. drawing dies

For drawing steel shell 20 thru 105 mm. Complete line of brass shell dies.

Standard Turning, Boring, Facing Tools for Steel, Cast Iron, Etc.

(You can grind to hundreds of special shapes. Wide range of sizes.)



Style 4
(Style 7, left hand)

Style 13
(Style 14, left hand)

Style 5
(Style 9, left hand)

Style 10
(Style 11, left hand)

Style 12

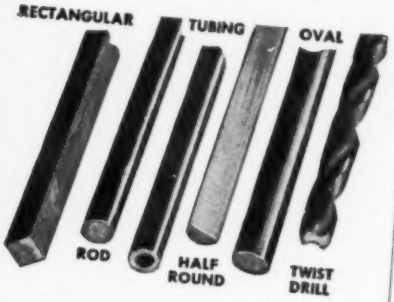
Style 1

*Standard Design TOOLS AND BLANKS

Standardized design items, in general, are former special tool styles for which there previously has been a large demand within a narrow range of minor design variations. Standard designs for these have been established to broadly meet most previous requirements. You can now order these items simply by tool number and eliminate considerable time for drafting, blueprints, quotations, detailed ordering, etc.

Extruded Shapes for Rod Tubing and Twist Drills

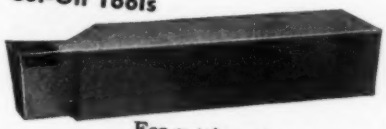
This unusual Carboloy Company development provides economical production of many unique shapes for wear resistant uses. Standards now available in lengths up to 30" in shapes shown. Specials where quantity warrants.



6 Films Available for Your Plant Training Program

Films show detailed step-by-step procedure on manufacture, design, application and maintenance of carbide tools. 35 mm. silent slide films (not motion pictures) available at approximate print cost of $20 per set.

Cut-Off Tools



For cutting off to hollow cores such as shell forgings, etc.

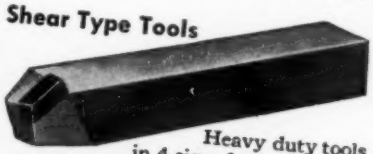
Tools for Roller Turners ("Box" Tools)

For W & S and Gisholt lathes. Extra large tips and special shapes provide long period of tool life.

Grooving Tools

Available in widths over .060" through .330" Tolerances up to .0004".

Shear Type Tools



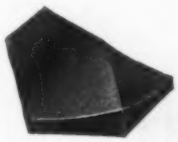
Heavy duty tools in 4 sizes for interrupted cuts on large forgings and castings.

Solid Carbide Guide Rings

For wear resistant uses on machines such as wire stranding machines. Increases life up to 50 times.

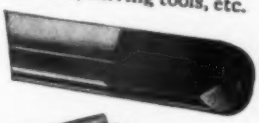
Bushings for Plug, Ring Gages and Drill Jigs

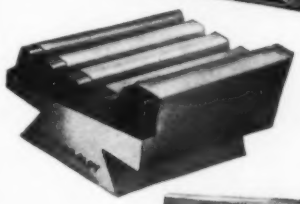
Twist Drill Carbide Blanks



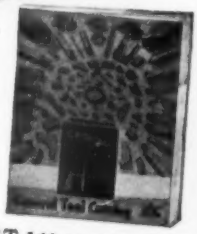
Standardized in 30 sizes from 1/8" to 1 5/8" diameter.

Also Selected Types of Special Tools—such as gun drills, form tools, grooving tools, skiving tools, etc.





Send for Free Catalog



32-page catalog GT-142 contains prices and specifications of all standard stock and standard design Carboloy Cemented Carbide tools. Also lists 76 tool manufacturers supplying special Carboloy-tipped cutters, gages, etc. Write for your copy today.

Meeting Carbide Demands 45 Times Greater Than Pre-War Years

CARBOLOY COMPANY, INC.

Sole makers of the Carboloy brand of cemented carbides

11149 E. 8 MILE ROAD, DETROIT, MICH.

Birmingham, Ala. • Chicago • Cleveland • Los Angeles • Newark • Philadelphia • Pittsburgh • Seattle

Canadian Distributor: Canadian General Electric Co., Ltd., Toronto, Canada

CARBOLOY

TRADEMARK

CEMENTED CARBIDES

Why Buy HALLOWELL WORK BENCHES?

1 YOU GET WHAT YOU WANT

Over 1367 "Hallowell" ready-made bench combinations to fit practically any need.

2 YOU KNOW WHAT THE COST WILL BE

Unlike when building your own benches, there's no hit-or-miss estimating of cost.

3 YOU CAN GET THEM QUICKLY

because deliveries of "Hallowell" Equipment are better than average.

4 THEY ARE A GOOD INVESTMENT

Well built for long usage. Constructed for easy movability.

Fig. 928.
Pat'd and Pats. pending. Drawer is extra.

Fig. 1927

FOR WARTIME SEATING
"HALLOWELL" WOOD STOOLS

Strong, comfortable, economical. Selected wood, firmly glued. Sizes 18", 21" and 24" with one set of rungs; 27" and 30" with two sets. Furnished with or without backrests having 3" vertical adjustments. Send for bulletin.

Write for literature on either of these products.

STANDARD PRESSED STEEL CO.
JENKINTOWN, PENNA. BOX 4
BRANCHES
BOSTON • DETROIT • INDIANAPOLIS • CHICAGO • ST. LOUIS • SAN FRANCISCO

Reel-Band

A "Jewel" for FAST HARD WORK

Abrasive

RED BAND DIAMOND TOOLS

Third Generation of Diamond Experience

ABRASIVE DRESSING TOOL COMPANY ★ DETROIT

Write for catalog showing prices and specifications

Use KENNAMETAL* the Precision tool

STYLE II

for CLOSER TOLERANCES

Accuracy in machining operations is dependent upon the hardness of the cutting tool. The individual particles of tungsten—titanium carbide in the tips of KENNAMETAL Tools is the factor that marks the superiority of KENNAMETAL over tools of the same Rockwell hardness.

Because of their great resistance to wear, KENNAMETAL steel-cutting carbide tools are giving accurate performance on long cuts in machine shops throughout the country, as shown in the illustrated operation. The extreme hardness of KENNAMETAL permits such accurate machining that roughing and finishing often can be combined in one cut. When close tolerances are needed, use KENNAMETAL . . . the tool of precision.

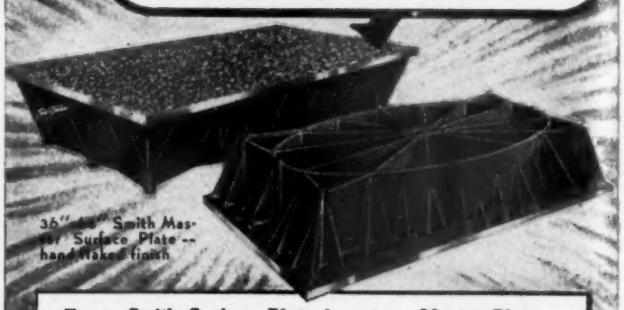
Write today for the new Kennametal Tool Manual.

KENNAMETAL THE All American CARBIDE

McKENNA METALS Co.
103 LLOYD AVE., LATROBE, PA.
Foreign sales: U. S. STEEL EXPORT CO., 30 Church St., New York
Distributors in Canada and Great Britain

For Close Tolerance Assembly and Inspection

SMITH MASTER SURFACE PLATES



36" x 48" Smith Master Surface Plate — hand flaked finish

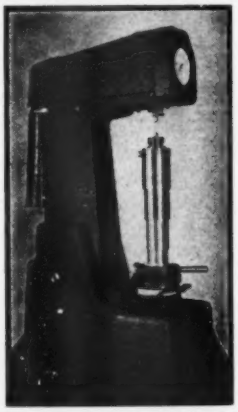
Every Smith Surface Plate is a true Master Plate—with precision lapped surface, relieved by hand flaking to provide the maximum number of uniform bearing points to meet gauge makers' requirements and to prevent gauges and the like from freezing. On specifications requiring a total flatness tolerance of one ten-thousandths of an inch, medium size Smith Surface Plates have successfully met the test to the entire satisfaction of hard-to-please users. Tolerance on larger plates in proportion. A large variety of standard sizes ranging from 8"x 12" to 48"x 120". For prices and delivery write, wire or phone.

SMITH TOOL & ENGINEERING CO.
Precision Measuring Equipment
851 N. Sandusky Ave. Bucyrus, Ohio

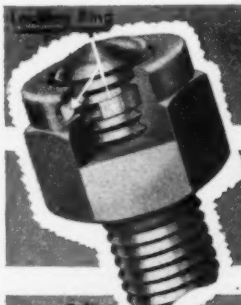
PROMPT DELIVERIES ON STANDARD SIZES

"ROCKWELL"
HARDNESS TESTER

BETTER and BETTER EACH YEAR SINCE 1921



WILSON
MECHANICAL INSTRUMENT CO., INC
Concord Ave. New York



UNSHAKO
Reg. U. S. Pat. Off.
SELF-LOCKING NUT
HOLDS TIGHT

Patd. & Pats. Pendg. Cut-out section showing locking ring in place.

STANDARD PRESSED STEEL CO.
BOX 4 JENKINTOWN, PENNA.

50 YEARS YOUNG

Fifty years of effort in the design, development and improvement of metal working equipment prepared Baush for the part it is playing in the present emergency.

The Army-Navy "E" Flag proudly waving over the Baush plant symbolizes the youthful, undaunted spirit which is guiding our war production efforts.

Always a pioneer*, Baush is performing a vital service today in helping to supply the urgent needs of the war production plants and thus pave the way for an early, permanent peace.

Baush is happy to be 50 years young and able to do its bit for the cause of the Allied Nations.

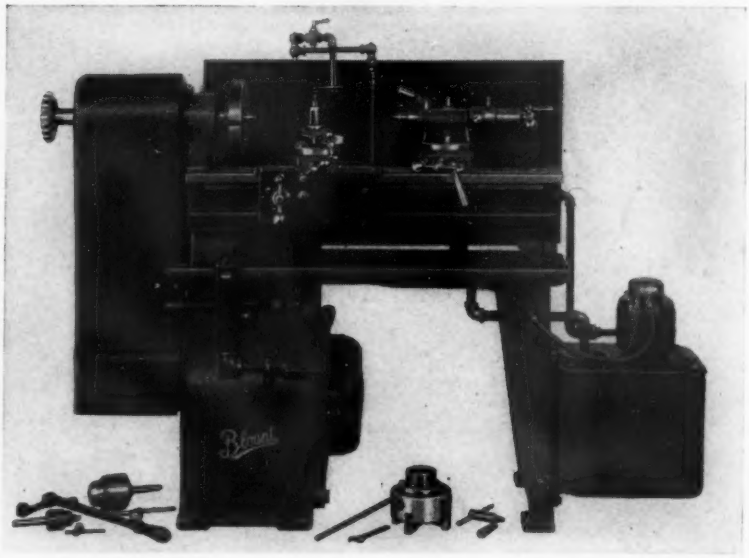
*Pioneers in Multiple Drilling, Tapping and Boring Machines as well as special equipment for the metal working field.

BAUSH MACHINE TOOL CO.

Springfield, Mass. · Detroit, Mich.

"Blount" Model B-5 Special Purpose LATHE

Adaptable to handling many new types of work . . . . .



The Model B-5 Blount Special Purpose Lathe together with various attachments available for it, is capable of wide utility, including turning, chucking, polishing and lapping.

It is equipped with a ½ H.P., 4-speed ball bearing headstock motor-in-leg which provides speeds of 575, 850, 1125 and 1725 R.P.M. It has an 11" swing and a 4' bed. Other speeds, swings and bed lengths are also available. With adjustable bracket mounted motor, belted to head, spindle speeds of 360, 510, 680 and 975 R.P.M. are offered.

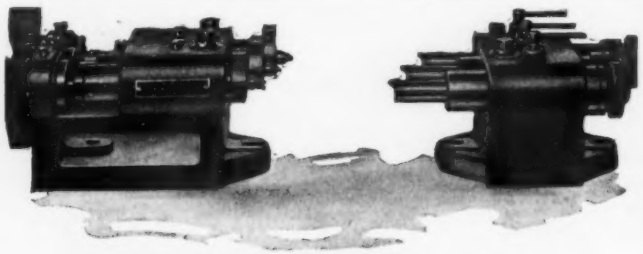
This lathe is equipped with drum controller, magnetic starter with pushbutton and disconnect switch. Spindle nose is 2⅜" dia. 10 v. threads. Spindle is fitted with hand wheel draw-in mechanism to accommodate Rivet No. 6 Collets, ⅛ to 1" capacities.

Equipment includes hand feed carriage and compound rest, full set-over-swivel tailstock V-belt drive and belt guard. Also coolant system complete including tank, strainer, pump, valves and piping.

Various accessories and attachments are also available.

Send for Bulletin D-18 which describes the various new Special Application Lathes developed by Blount.

J. G. BLOUNT COMPANY
Everett, Mass. U. S. A.



THIRTY YEARS EXPERIENCE MANUFACTURING

MULTIPLE SPINDLE INDEX CENTERS

ADJUSTABLE ANGLE ILLUSTRATED

Three and four spindles of various types and sizes.

Write for circular.

JOHN B. STEVENS INC. • 474 Canal St., New York, N. Y.

AIR and HYDRAULIC

Hanna Cylinders

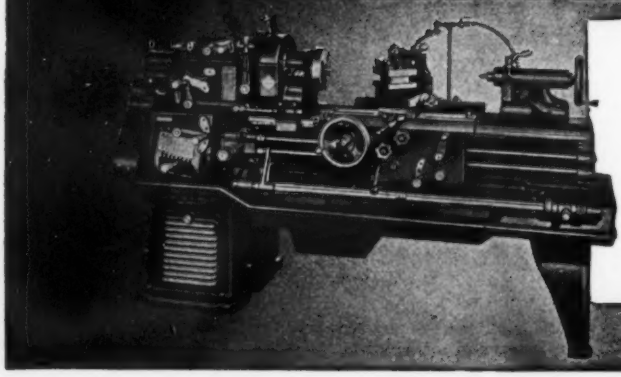
Dependable power for pushing, pulling or lifting. Standard models, air or hydraulic, low or high pressure, for all requirements. Write for full details.

HANNA ENGINEERING WORKS • 1767 ELSTON AVE., CHICAGO

Remelt and Cast Your Lead Hammers with the Field Mould and Ladle

Save time and money—keep lead hammers in good condition at all times—easy to use—fast. Made in 7 sizes for hammers from 1 to 11 lbs. Write for details.
Also, Lead Hammers, sizes 1 to 15 lbs. always in stock.

JOHNSON TOOL CO., INC.
East Providence Rhode Island, U.S.A.



Speed Mass Production of Aircraft and Munitions

In continuous operation on precision jobs, Cincinnati Lathes are speeding war production. Their wide range of feeds and speeds, plus the extra heavy construction of bed and ways, permit efficient operations on any job in any material. Write for latest catalog giving detail of 14" to 30" sizes.

THE CINCINNATI LATHE & TOOL CO.
Rogers Road, Oakley Cincinnati, Ohio
SPECIALISTS SINCE 1906

DELIVERING CONSISTENT ACCURACY AT HIGH SPEEDS

. . . and low overall cost!

MODEL Lo-swing LR

. . . WITH

- **SIMPLIFIED CHANGE-OVER MECHANISM**
- **SMOOTH HIGH-SPEED DRIVE THRU MULTIPLE "V" BELTS**
- **HEAD AND TAILSTOCK SPINDLES ON THREE PRECISION, PRELOADED BALL BEARINGS**
- **IMPROVED MECHANICAL BRAKE THAT OPERATES AUTOMATICALLY WITH *START* AND *STOP* LEVERS**
- **HARDENED STEEL WAYS**
- **OTHER FEATURES THAT REDUCE SETUP TIME**

THE Model "LR" Lo-swing's field includes practically any work within its capacity—2″ diameter for heavy stock removal, 4″ diameter for light cuts, 5″ diameter for flanged work—and up to 46″ between centers in the longest bed length. Ease of setup and operation are provided not only by the Simplified Change-over Mechanism but by convenient levers for throwing in and out the feed and rapid traverse (normally automatic) manually, and by the low center height (37-7/8″) which allows the operator to examine and adjust all tools from the operating position. Low center height also contributes to ease of loading.

The Model "LR" is designed to provide maximum efficiency with carbide tools. It is a versatile lathe in that it may be equipped with either direct V belt drive to the spindle for high speed, fine finishing cuts, or a geared drive with pick-off gears for slower roughing cuts. This lathe may also be equipped with a third slide (overhead) as well as additional back squaring attachments, carriages and carriage slides, making for innumerable tooling possibilities.

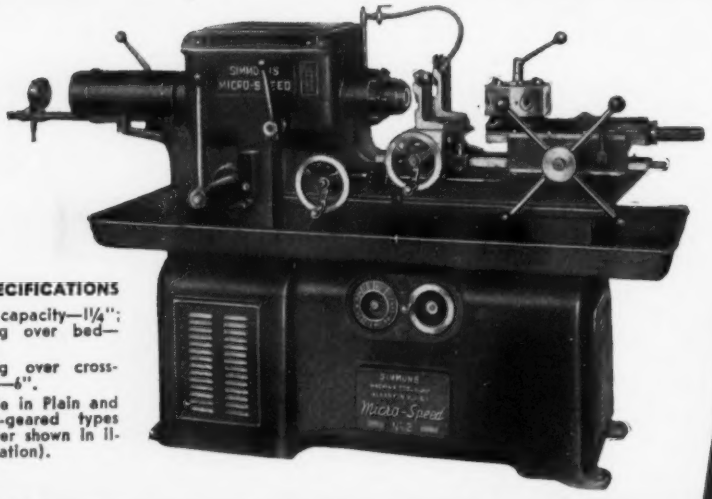
For the past several years, many of these lathes have been demonstrating their speed, accuracy, economy and stamina on the critical proving ground of continuous war production.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

LATHE NEWS from SENECA FALLS

QUICK DELIVERIES **TO HIGH-RATING PRIORITY HOLDERS**

SIMMONS
NO. 2 TURRET SCREW MACHINE



SPECIFICATIONS

Bar capacity—1¼";
Swing over bed—14";
Swing over cross-slide—6".
Made in Plain and Back-geared types (latter shown in illustration).

MICRO-SPEED DRIVE*

The unusual quick-production advantages of this sturdy turret lathe are being utilized in hundreds of important war-producing plants . . . Bendix, Curtiss-Wright, Cessna, Fairchild, Bell, Sterling Engine, Greist Manufacturing, Swift Lubricator to name a few.

*The patented SIMMONS *Micro-Speed Drive*, equipped with Selector Dial Control and a spindle brake and clutch, offers a range of spindle speeds up to 1,500 RPM. With this drive, the operator can immediately select by a mere turn of the handwheel the best-suited spindle speed for the class of stock to be machined.

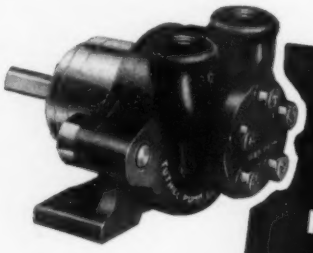
Particular attention is called to the construction of the spindle. Opposed anti-friction bearings on the head end control the longitudinal adjustment, while the straight Timken precision roller bearing on the rear end allows for expansion without disturbing the spindle adjustment.

Ask Today for Complete Description

LOW COST

SIMMONS MACHINE TOOL CORPORATION

1759 NORTH BROADWAY, ALBANY, N. Y.



A HANDFUL OF DEPENDABILITY FOR VITAL PUMPING JOBS

TUTHILL

MODEL L

SMALL INDUSTRIAL PUMPS

SAVE SPACE
SAVE MATERIAL
SAVE TIME
SAVE MAINTENANCE
SAVE MONEY

Ideal for coolant, lubrication, hydraulic mechanisms, fuel oil and liquid transfer service.

These positive-displacement, internal-gear rotary pumps are available in capacities from .33 to 3 g.p.m. and pressures up to 400 p.s.i. Ring or foot mounted. Mechanically sealed.

TUTHILL PUMPS ARE SERVING
ARMY • NAVY • AIR FORCES
MERCHANT MARINE

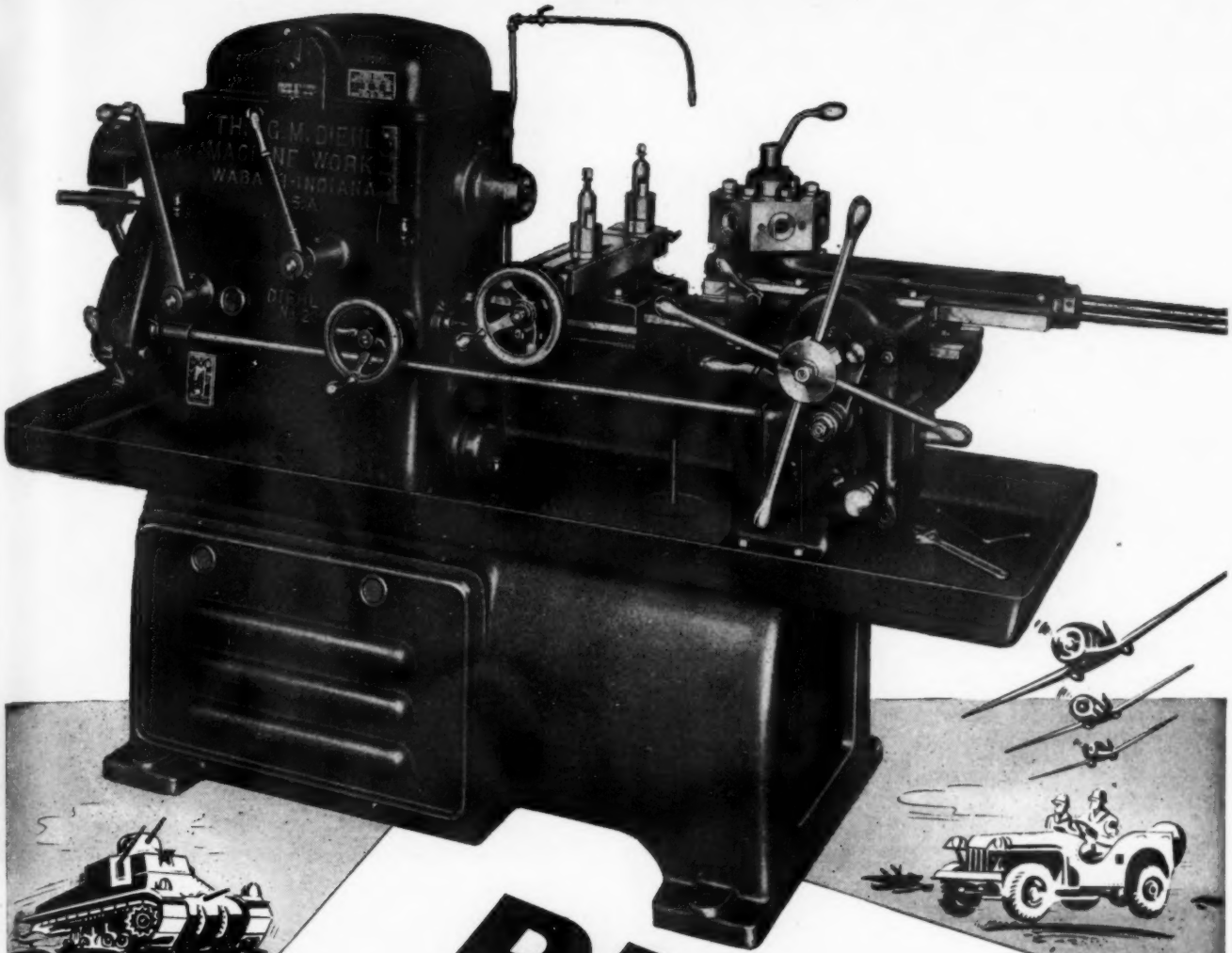
Write for Catalog

Tuthill PUMP COMPANY
939 East 95th Street • Chicago, Illinois

Characteristic of the design of all STURDIMATIC LIVE CENTERS is a low overhang and a slight cushioning action . . .
that compensates for expansion due to heat, shock and excessive thrust loads—reducing wear to a minimum. A properly engineered live center is one of the fundamentals of setting up a job and requires a specialist's experience . . . standard shanks with Morse taper carried in stock.

Send us your specifications and blueprints—We will see that your job is set up with the right LIVE CENTER—prompt deliveries on high priorities.

STURDIMATIC
TOOL COMPANY
5214 THIRD AVE. DETROIT, MICH.



DIEHL

for Exacting War Jobs!

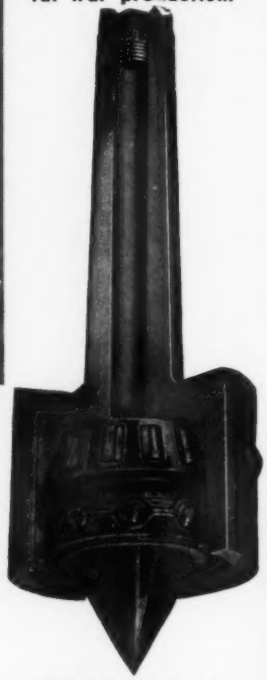
The planes, tanks and guns that roll off the production lines for our fighting forces and our allies can only be as good as the machines that make them. The battle-front arms and the equipment that produce them must be the best. Diehl Power Feed No. 2 Turret Lathe is designed for high speed, precision war production and works alongside any other No. 2 lathe of standard make, using same tooling, including collets. Automatic chuck capacity (round) 1" . . . swing-over cross slide, 6" . . . over bed, 14". Six speeds, forward and reverse. Write for complete specifications and illustrated brochure.

Where precision craftmanship is honored

The G. M. DIEHL MACHINE WORKS Wabash, Indiana

3 IDEAL WAYS TO Speed WAR PRODUCTION

Here are a few of the many IDEAL products which are helping to speed vital war production.



1 IDEAL

LIVE CENTERS

Take Deeper Cuts At Higher Speeds

IDEAL Live Centers not only permit deeper cuts at higher speed, but carry heavier loads, because the IDEAL Live Center rotates with the work. Radial load carried by high precision ball bearings, thrust load absorbed by high precision taper roller bearing. All parts hardened and ground.

TRIPLE DUTY

3 Interchangeable Center Pieces. For all centered and uncentered work.

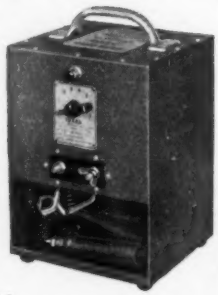
2 IDEAL

METAL ETCHER

Permanently Marks

TOOLS, DIES, PARTS, GAGES, ETC.

NEW!



New, All-Purpose Etcher for permanently marking smooth-surfaced iron, steel and their alloys. 14 heats. Etches legibly, easily, permanently, regardless of the hardness of the metal. Ground clamp for etching large, heavy parts and castings.

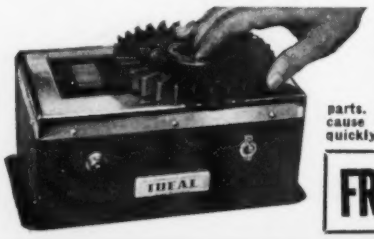
MOST COMPLETE LINE OF MARKING TOOLS

Powerful — Portable. **3**

IDEAL

DEMAGNETIZER

Keeps Tools Sharp Longer



Quickly demagnetizes work held in magnetic chucks, tools, drills, punches, dies, etc. Abrasive particles practically disappear after a single pass across the magnetic poles. For small tools or large parts. Demagnetized tools cut faster because they do not bind, heat and dull quickly.

FREE Machine Tool Accessory Catalog gives information on these and many other time-saving tools.

IDEAL COMMUTATOR DRESSER CO.

1057 PARK AVENUE — SYCAMORE, ILLINOIS

SALES OFFICES IN ALL PRINCIPAL CITIES

In Canada: Irving Smith, Ltd., Montreal, Quebec

Immediate delivery from stock

- Collet Model 3AT & Drawbars for ATLAS and LOGAN 10" Lathes
- Collet Model 480 for new Logan Screw Machine & Turret Lathe
  (Same as Warner & Swasey No. 1)
- Drawbars for 9" South Bend

Precision Collets and Drawbars

Of importance far beyond their size or dollar value, Collets and Drawbars are vitally needed on the production line and in the tool room. Our ability to deliver immediately from stock during war-time . . . and to deliver with no sacrifice in accuracy, is rapidly giving the *Precision* name an honored place in industry.

When collet work is indicated, specify *Precision*. Your dealer can supply you with these unconditionally guaranteed, longer lasting products. *Literature on request.*

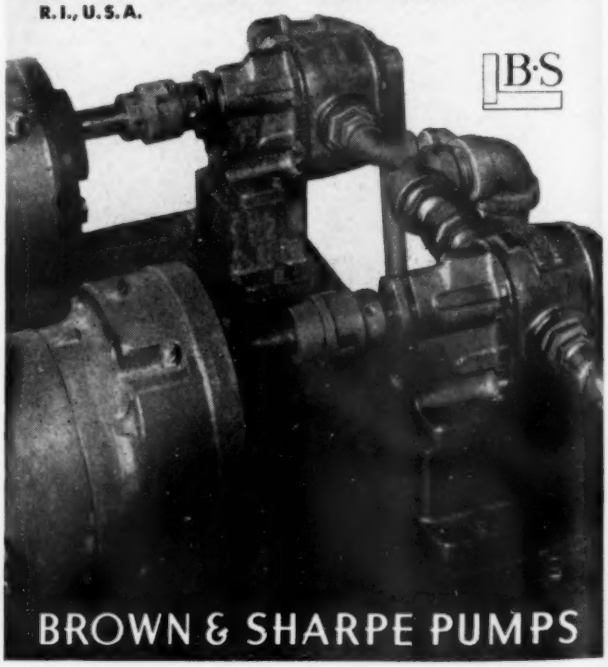
GENERAL DIE — STAMPING — TOOL COMPANY

PRECISION COLLET DIVISION • 265 Canal Street, New York City

BROWN & SHARPE PUMP SETS

For Transfer — Lubrication — Coolant Supply

Pump Sets with motors, pumps and bed plates, direct or gear reduction drives, are advantageous for many industrial applications. Here two Sets are transferring oil from hardening room to cooling tank. Catalog listing Rotary Geared, Vane and Centrifugal Pumps forwarded upon request. Brown & Sharpe Mfg. Co., Providence, R.I., U.S.A.



BROWN & SHARPE PUMPS

FORMED WHEEL GRINDING ...

Gears, Splines and Racks

EXTERNAL GEARS

INTERNAL GEARS

EXTERNAL SPLINES

INTERNAL SPLINES

RACKS

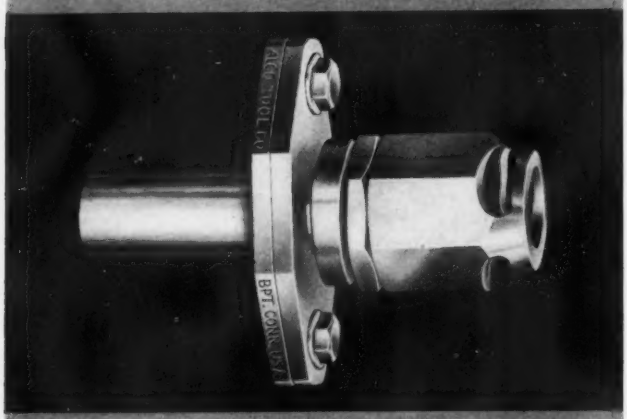
The Formed Wheel Method of grinding with accurate hardened and ground index plates, enables GEARGRIND Machines to meet the exacting requirements of war production. *"Hob, harden and grind"* eliminates the worries caused by the frequently changed steel specifications resulting from the war.

We manufacture GEARGRIND Machines for the Formed Wheel Grinding of external and internal gears, external and internal involute splines, straight splines, racks and serrations. Catalog on request.

GEARGRIND—TYPE GG-19
Model shown grinds up to 10" diameter external gears. Other models handle sizes up to 72", with varying center distances.

The GEAR GRINDING MACHINE COMPANY
DETROIT, MICH. U.S.A.

A New Releasing Model Acorn Type Die Holder



by ALCO

The Greatest improvement in an Acorn Type Die Holder for use on Screw Machines and Turret Lathes. Wide range of sizes for dies from $\frac{1}{8}$" to $1\frac{1}{2}$". Each tool is quickly adjustable to take several diameters of dies.

- The only acorn type releasing model with adjustable concentric alignment.
- Produces perfect work even on old machines with worn turrets or bearings.
- Absolutely rigid drive effected without the use of pins.
- Exact alignment of die accomplished through use of ground contact surfaces.
- Quick, positive set-up of die absolutely concentric with the work.
- Ample allowance for chip elimination and proper lubrication.
- Forget thread inspections—all are cut perfectly—no rejects.

Every minute, every hour of efficient production time becomes more valuable and more necessary as the demands of our armed forces increase. Make every minute count—adopt the most efficient tools and methods to stop waste, speed up production, save man hours, and get this global war job done. Then be ready for the new era of production after the peace.

Complete details in catalog No. 3. Write, wire or phone for a copy. Send for name of ALCO representative in your vicinity.

ALCO TOOLS

The ALCO TOOL CO.

353 Birdseye St., Bridgeport, Conn. Detroit Office—908 Stephenson Bldg.

"NO OUTSIDE PIPING.."

with this type

GUSHER COOLANT PUMP

Ruthman Gusher Coolant Pumps are "in the lead" with this modern internal discharge type pump.

You get *patented and exclusive* features that speed production when you use Gusher Pumps.

Our line includes immersed types, tank units, pipe-connected types, flange-mounted types and plain drive types.

From a dribble to 200 g.p.m.—1/30 to 2 H.P. There's a Gusher to meet your needs. Write.

Internal Discharge Type available from 1/10 to ¾ H. P.

Patented
Patents applied for

Internal discharge thru center of intake eliminates outside piping.

THE RUTHMAN MACHINERY CO.

1809 READING ROAD CINCINNATI, OHIO

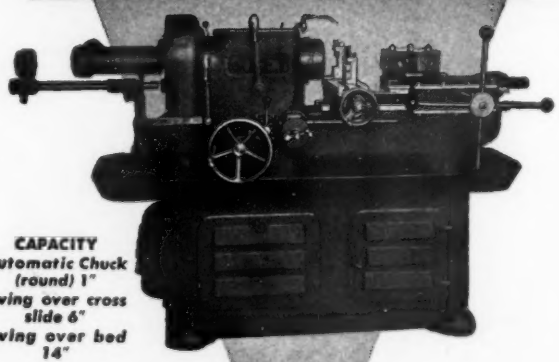
LARGEST EXCLUSIVE BUILDERS OF COOLANT PUMPS

for ECONOMY—for HIGH SPEED PRODUCTIO

The MOREY 2G Back-Geared TURRET LATHE

Timken Bearing

Self-Locking Turret and Infinite Spindle Speeds



CAPACITY
Automatic Chuck (round) 1"
Swing over cross slide 6"
Swing over bed 14"

Thousands of the MOREY 2G Turret Lathes are saving money with no sacrifice of high speed production. Economy features: Back Gears are instantly thrown in through extra large Twin Disc Clutch—Full advantage from high speed and carbide tools—Vibrationless precision and an infinite variety of spindle speeds for every job—Timken bearing—Self-locking turret. Can be furnished with tooling.

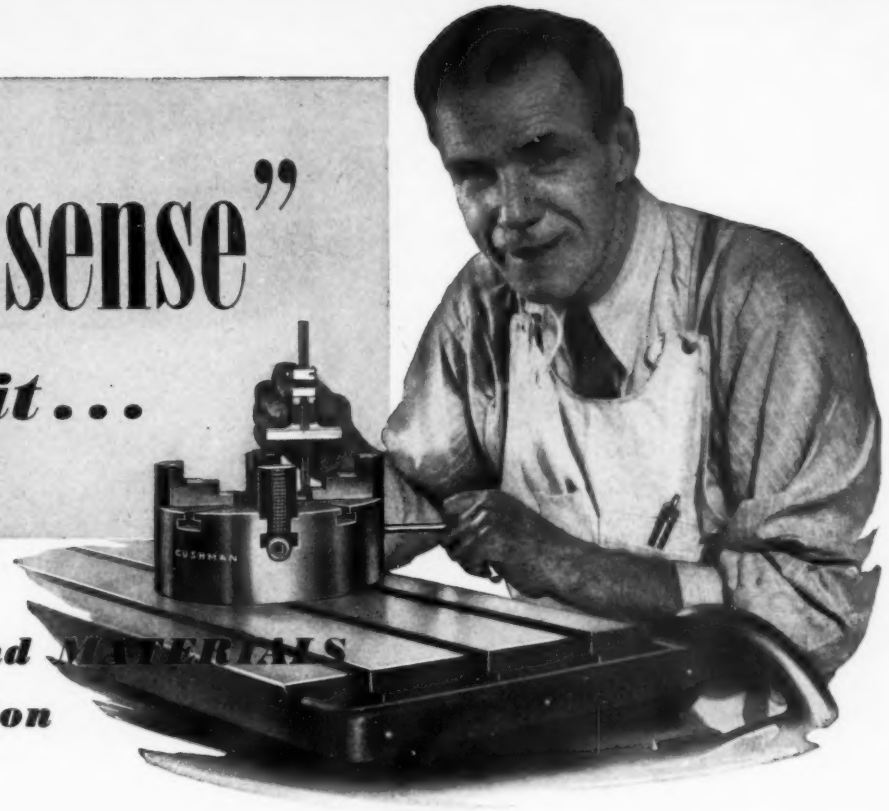
Ask for Circular 629 for full details

MOREY MACHINERY CO., INC

410 BROOME STREET • NEW YORK, N. Y.

"chuck sense"

we call it...



SAVES TIME and MATERIALS
speeds production

As delivered to you on your new machine tool or for replacement, a Cushman Chuck is one of the most carefully designed, built and inspected pieces of equipment in your shop. It has been made to hold its high initial accuracy throughout a long service life. It is ready to turn out an impressive total volume of war material today and peace-time products tomorrow...if it is not abused.

Of course we realize that high production and possibly unskilled operators will result in a certain amount of "abuse". Cushman Chucks are built to "take it". But anybody can learn the simple fundamentals of good chuck maintenance and correct practice. There are just six simple rules printed on our "Chuck Check" cards that are available for your use. Write us today for the quantity you need. The Cushman Chuck Co., Hartford, Conn.

These small cards can be given to operators or put on bulletin boards. They'll help save time, save chucks and reduce spoilage.

CUSHMAN

A World Standard for PRECISION

TUNGSTEN
CARBIDE TIPPED TOOLS
Price $1.00 Each In Any Size

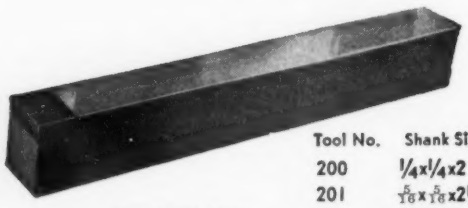
New Low Prices—Increase Production—
Cut Operating Costs

Tools are tipped with Tungsten Carbide, and are suitable for machining cast-iron, brass, bronze, aluminum, non-ferrous materials such as hard rubber, bakelite, fibre, and tough alloy steels up to 500 Brinell hardness

Left Hand-Reverse Image. Right Hand Shown

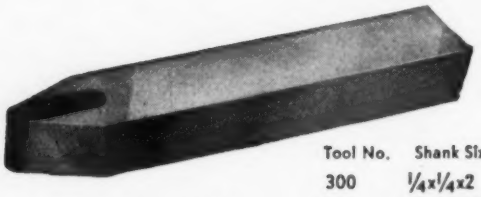
SERIES 100

Tool No. RH	LH	Shank Size
R-100	L-100	1/4x1/4x2
R-101	L-102	5/16x5/16x2 1/4
R-103	L-104	3/8x3/8x2 1/2
R-105	L-106	7/16x7/16x3
R-107	L-108	1/2x1/2x3 1/2



SERIES 200

Tool No.	Shank Size
200	1/4x1/4x2
201	5/16x5/16x2 1/4
202	3/8x3/8x2 1/2
203	7/16x7/16x3
204	1/2x1/2x3 1/2



SERIES 300

Tool No.	Shank Size
300	1/4x1/4x2
301	5/16x5/16x2 1/2
302	3/8x3/8x2 1/2
303	1/2x1/2x3 1/2

Standard Tungsten Carbide Tipped Tool Bits

In lots of 12 assorted in any Series; 100-200-300 Series an extra 10% will be allowed; also in lots of 50 assorted 20% discount will be allowed.

Sizes not listed as well as special TIPPED TOOLS will be quoted upon request. When ordering, state tool number and quantity desired.

WE CARRY SILICON CARBIDE EMERY WHEELS FOR GRINDING TUNGSTEN CARBIDE TOOL BITS

Send for our latest circulars

VICTOR MACHINERY EXCHANGE, Inc.
251 CENTER STREET NEW YORK, N. Y.

DON'T WAIT FOR TURRET LATHES

Convert any engine lathe into a turret lathe in 15 seconds with JEFFERSON TURRET ATTACHMENTS. To fit bench lathes and lathes up to 24" swing

● This new modern TOOL-POST TURRET (below, right), made in 2 sizes, designed to increase production on engine lathes. Easily mounted on cross slide or compound rest. Has capacity of 4 standard tool holders which are easily inserted and rigidly held.

6 Days Delivery

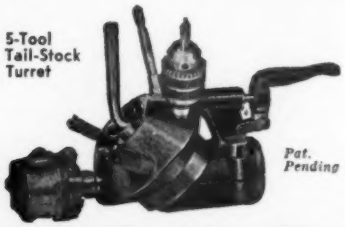
● Then there's the completely modernized 5-tool TAIL-STOCK TURRET (below), made in 4 sizes to fit small bench lathes and lathes up to 24" swing. Also the adjustable PULL-FEED LEVER. Jefferson Turrets are real production tools—substantial, rigid, accurate. They must not be confused with the small make-shift gadgets now on the markets.

Pat. Pending

4-Tool Tool-Post Turret

The Jefferson Bull-Dog Precision Milling Machine. Obtainable Power or Hand Feed.

5-Tool Tail-Stock Turret



Pat. Pending

● **ALSO—*Milling Machines, Milling Machine Dividing Heads, Vises, Belt Sanders, Swing Frame Grinders, Gyratory Foundry Riddles.***

JEFFERSON MACHINE TOOL CO.
SO. SWEENEY, CUTTER & FOURTH STS. CINCINNATI, OHIO

ERICKSON

Precision

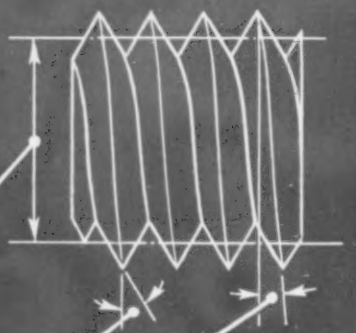
COLLET CHUCKS

The MODERN CHUCK for MODERN OPERATIONS

Send FOR BULLETIN "D"

ERICKSON STEEL CO.
2309 HAMILTON AVE. CLEVELAND, OHIO

Check these quickly, accurately . .



with VARD precision Snap Gages

If your pitch diameter is right; if your thread form angle is accurate; if your lead is correct—a VARD Snap Gage will quickly pass the threads through the GO rolls and stop them at the NO GO rolls. In one easy movement you can see and feel the accuracy of your threads. You can check your work while it is still in the machine. You can gage threads flush against a working shoulder.

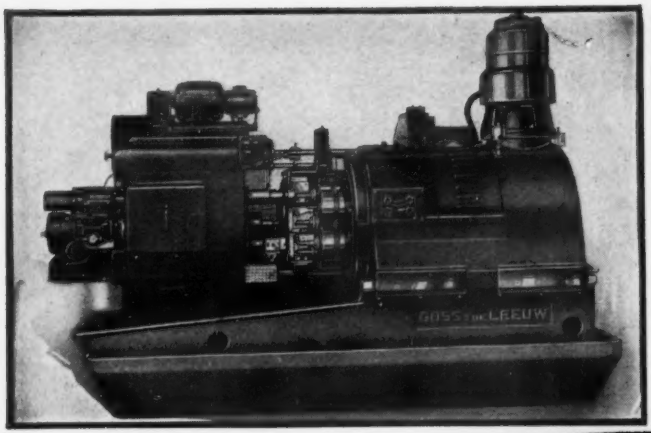
The VARD Snap Gage has an improved type of frame with convenient machine pads for use in a vise.

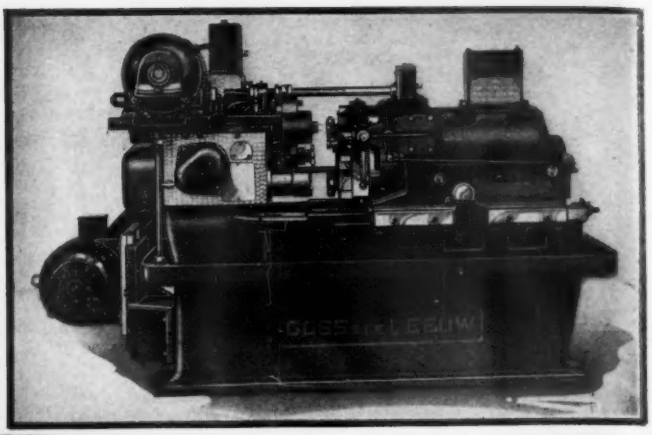
The accurate rolls are ground from highest quality tool steel and are adjustable to compensate for wear. We make these gages in a full range of sizes and in all Standard thread forms, English, Metric and right and left hand threads in all classes of fit.

VARD INC.

Special Taps • Plain Tapered Ring Gages • Thread & Plug Gages • Bench Model External Comparators • Precision Ground Optical Lenses & Filters • Aircraft Geared Parts • Aircraft Hydraulic

PASADENA, CALIFORNIA, U. S. A.





WORK ROTATING TYPE

5 Spindles
6 Spindles
8 Spindles

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES

TOOL ROTATING TYPE

4 Spindles
5 Chucking Positions

On these machines, two threading operations can be handled simultaneously, each thread controlled by its own lead screw.

Among the many other modern features offered in both types are: pre-loaded anti-friction spindle bearings, hardened ways, oversize spindles and gears of chrome-nickel steel, heat-treated.

Complete details will be found in descriptive catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

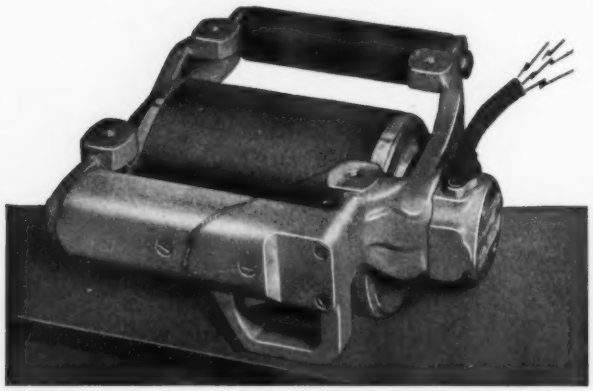
WALKER MAGNETIC CHUCKS

Style B Face Plate—in standard diameters from 10⅜" to 36½" inclusive.

No. 617 Bar Pole Face Rectangular Magnetic Chuck.

DEMAGNETIZERS

Walker DEMAGNETIZERS are available in standard D.C. and A.C. types for either 110 or 220 v. Ask for Bulletin K7 giving detailed specifications.



A FULL LINE OF PROVED STANDARD DESIGNS

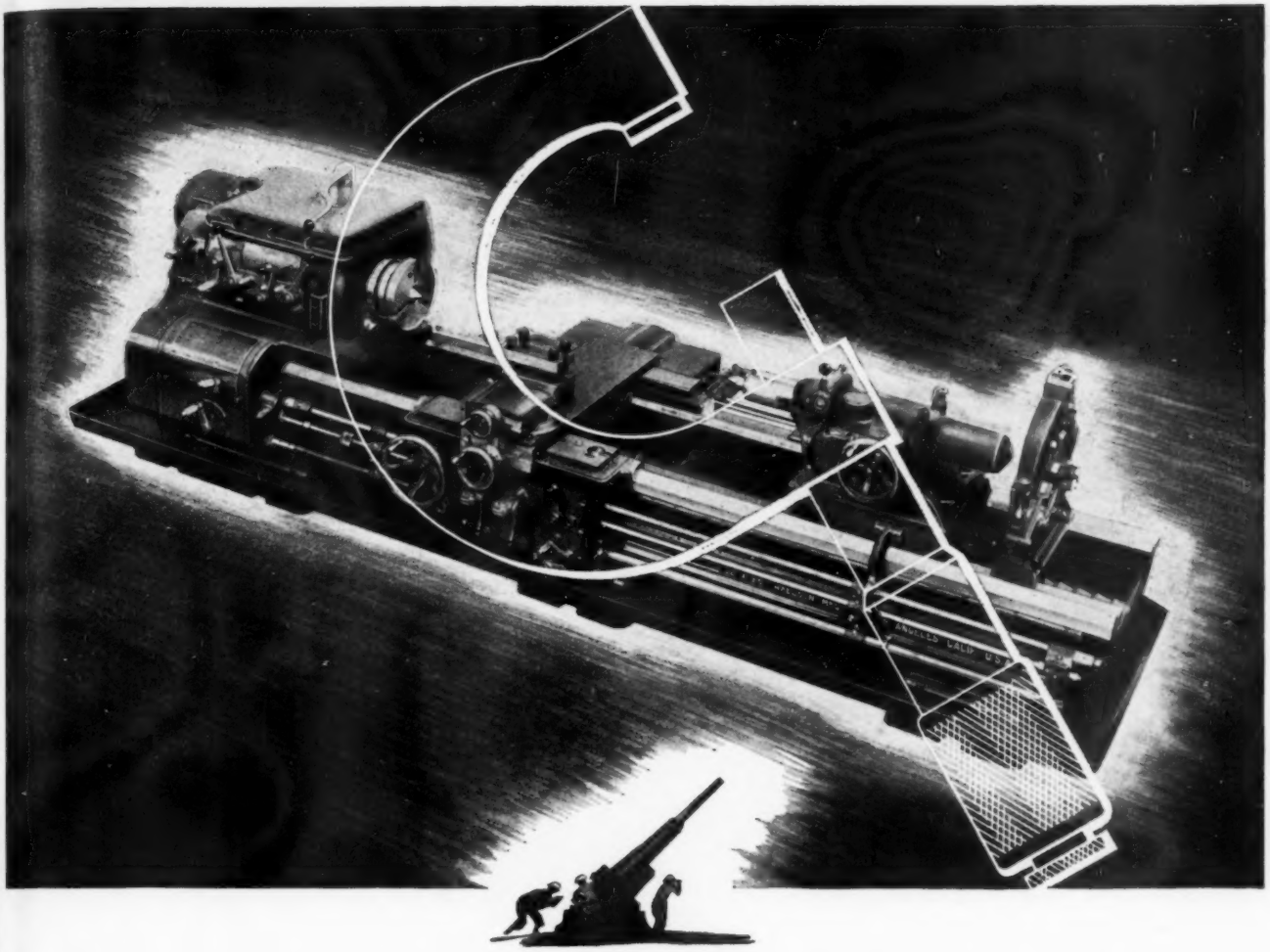
Walker offers prompt and complete service on magnetic chucks by carrying in stock a considerable line of Rectangular and Rotary types for use on all surface and internal grinding machines built by American machine tool manufacturers. These units—for grinding, milling, planing and turning operations—are of proved design and are available in such a complete range of sizes as to enable you to select standard units for practically any chucking problem. Write for bulletin W4 giving detailed information.

Also special CHUCKS *for special* NEEDS

The design of Walker Magnetic Chucks is such that "specials" can be developed and furnished at prices only slightly more than standard units. If you require special magnetic chucks for special purposes, consult Walker and be assured of prompt, economical service.

O. S. WALKER CO., INC.

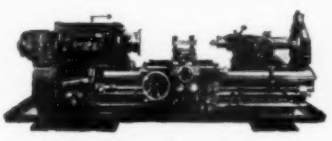
WORCESTER, MASS.



Accuracy is a Fighting Word with Us

Micrometer precision! That's what you need for making the implements for dealing with the Axis. And that's what the many users of Axelson Lathes are getting. We have always striven to make our lathes capable of working to very close tolerances, and today we realize that this one feature is supremely essential to prevent rejects, to speed up production, to turn out effective products for delivering death blows to our enemies. Yes, accuracy is a *fighting* word with us—for we know what it means in achieving victory—and every Axelson Craftsman is guided by this thought.

Vital as it is in wartime, accuracy will be equally important when the War is won. Competition will be keener than ever before, and only those manufacturers who can make high quality products at low cost will stay on top. Preparing for the post-war period, Axelson Engineers are conducting intensive research on lathe improvements. They're studying the performance of today's lathes under every conceivable condition, they're analyzing new materials and they're developing refinements which will result in greater accuracy and lower operating cost. Out of this research will come finer Axelson Lathes—the kind you will need for peacetime competition.



Before you buy any lathe, investigate Axelson. They're available in 14, 16, 18, 20, 25 and 32-inch sizes in various lengths. And they have a 24-speed headstock, a 2-speed tailstock spindle, a unit mounted constant speed motor and many other exclusive features.

AXELSON MANUFACTURING COMPANY
6160 South Boyle Ave., Los Angeles, Calif.
(P. O. Box 98, Vernon Station)
50 Church Street, New York City, N. Y.
3844 Walsh Street, St. Louis, Missouri

AXELSON LATHES

ARMY E NAVY
THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

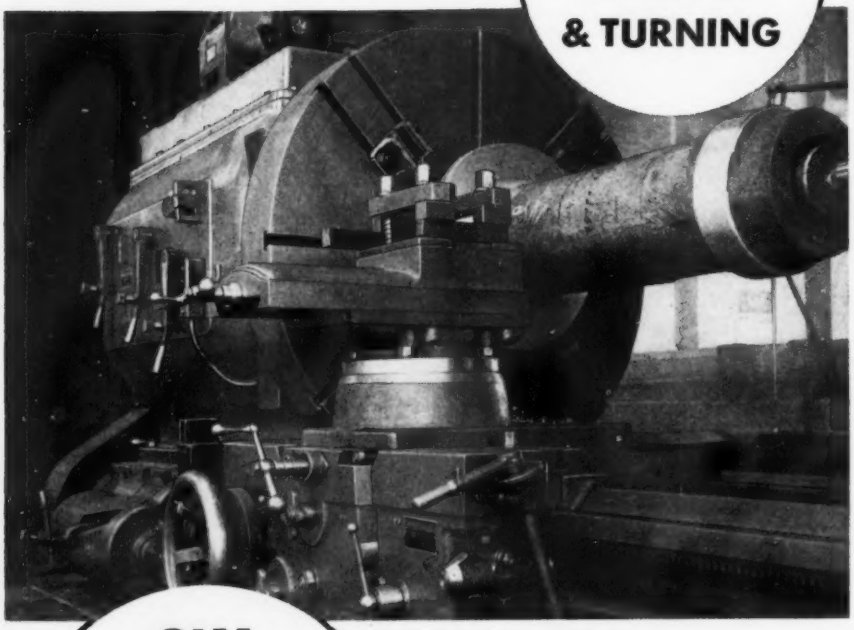
DEPENDABLE FOR OVER A QUARTER CENTURY

Sommerfeld

(Formerly Pittsburgh)

LATHES

TURNING
* * *
BORING
& TURNING



SIX WEEKS DELIVERY
NOW POSSIBLE
ON 50 or 60
INCH UNIT

This powerful lathe might be called the "Double-Time Worker" because it bores and turns simultaneously—thus practically cutting in half, your set-up and working time, your floor-space requirements, your capital investment and your labor requirements.

The operating improvements and refinements found in Sommerfeld Lathes have come out of thirty years' experience in the lathe business.

At the present time, we are in position to quote six weeks delivery from receipt of order (subject to prior sale) on either the 50 inch or 60 inch lathes, either turning only, or combination boring and turning.

Sommerfeld
MACHINE COMPANY
BRADDOCK, PA.
Makers of Machine Tools since 1895

Working with
UNFAMILIAR
and
DIFFICULT
MATERIALS?

★ October 5, 1938, *American Machinist* inaugurated its regular series of "Working of Materials" sections. These familiar, and highly respected, "blue sections", compacted from suggestions and practices of authorities in each field, are now used extensively by Metal-Working plants busy on armament orders.

Each details characteristics of a particular material, or group of materials, and gives latest practical data on fabrication. They will help you—and are typical of the useful and exclusive editorial content that *American Machinist* brings you fortnightly.

Over 115,000 reprints have been requested, exhausting our stocks on a number of subjects. Those listed below, however, are still available, although stocks on some are limited. If you want extra copies, order *now* while our supply lasts.

1 Working of Aluminum Alloys
2 Working of Magnesium Alloys
3 Working of S A E Nickel Alloy Steels
4 Working of Stainless Steels
5 Alternate Steels for Emergency Use
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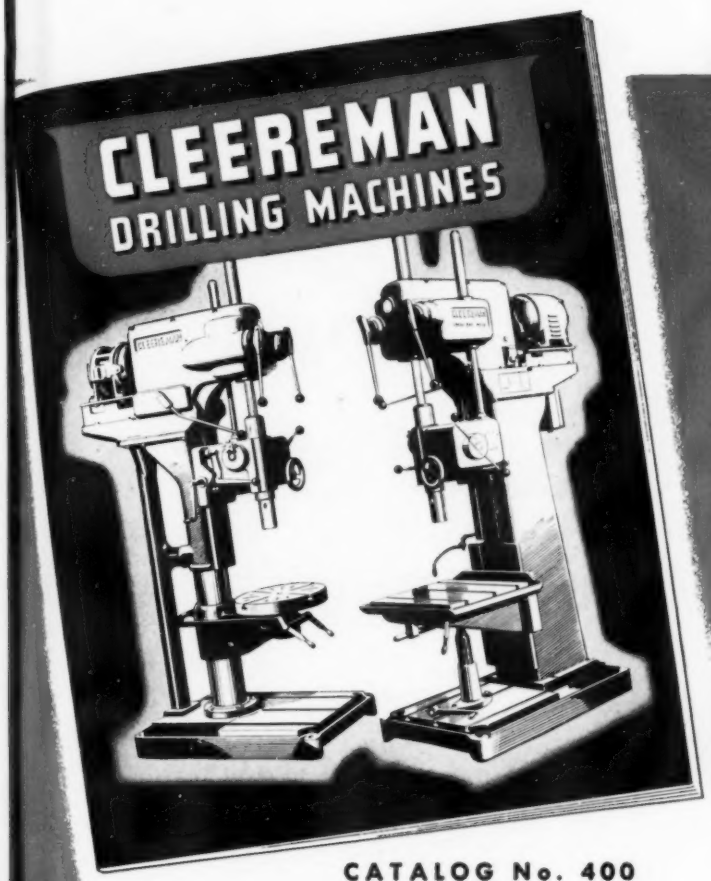

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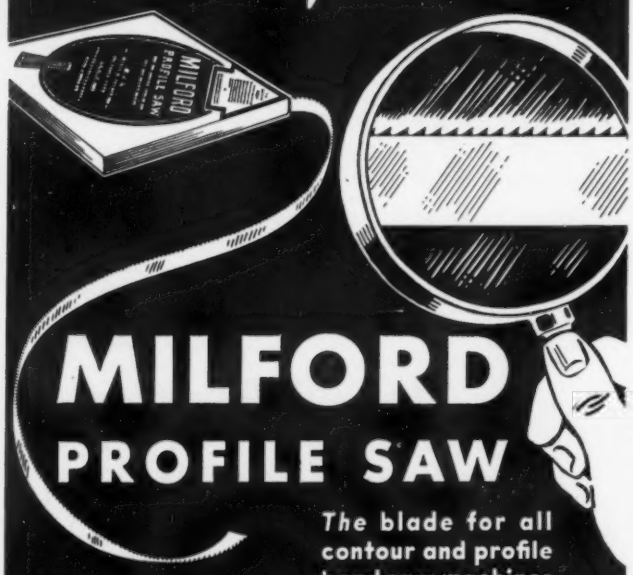

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The blade for all contour and profile band saw machines

From Saw Specialists comes the latest answer to the problem of getting maximum and uniform cutting production from all contour and profile band saw machines. A new automatically controlled method of heat treatment of metal cutting saw guarantees the uniform depth of hardness of every foot of PROFILE SAW. Uniform depth is tested by "etching" sample pieces of each saw . . . the surest, oldest method known to metallurgy.

Research in our own shops never stops . . . even under the pressure of War Production, and the accurate control of the depth of hardness of each tooth is but one of several new developments.

MILFORD PROFILE SAW is made and guaranteed by its originators and the world's largest producer of metal cutting band saw blades.

Order from your mill supply distributor

Perhaps you have not yet adapted your band saw machines to Profile Sawing. In that case be sure to write us for directions giving description of cutting jobs and machines.

THE HENRY G. THOMPSON & SON COMPANY
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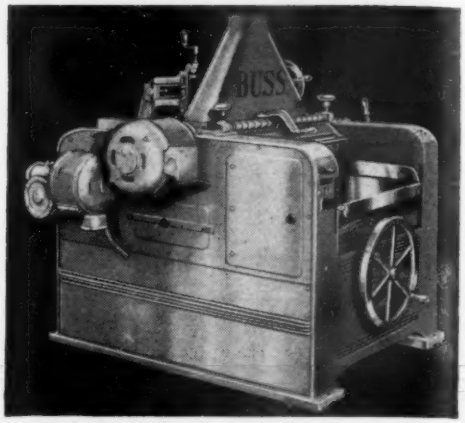
Also makers of MILFORD REZISTOR HACKSAW BLADES

BUSS *Wood Surfacers*



GIVE YOU THE ABSOLUTE PRECISION ESSENTIAL IN PATTERN and JIG MAKING!

—plus faster change-over, greater convenience of operation and the assurance of years of perfect service. Write for Bulletins Type 4-L showing the many patented features which make this the finest of all surfacers for pattern and jig departments. Production Models to suit every circumstance. We specialize in surfacers.

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Suitable for 105 M.M. to 155 M.M. Shells

- HYDRAULIC FEED
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The MOREY "27" SHELL LATHE

Timken Tapered Roller Bearings for Main Spindle—All Others Anti-Friction

The HYDRAULIC FEED insures an almost effortless operation. Rigid enough to use carbide tools to their full capacity—entirely self-contained—no outside or auxiliary equipment required! Details in Circular 715—ask for it.

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SPECIFICATIONS

- Swing Over Bed, 10"
- Bed Length, 43⅛"
- Spindle Hole, 25/32" Capacity, ⅝"
- Pre-Loaded Precision Ball Bearing Spindle Mounting
- 12 Spindle Speeds, 30 to 1450 R.P.M.
- Cross Slide Stroke, 3¼"
- Six-Position, Automatic Indexing Turret
- Stroke of Turret, 4¼"
- Precision Ground Ways; 2 Prismatic V-Ways and 2 Flat Ways

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

Logan Speed Collet Chuck for the No. 850 Lathe or others with a 1½" x 8-thread spindle nose. Capacity: ⅝" round bar stock. Quick acting. Positive squeeze grip actuated by plastic hand wheel. No keys or wrenches.

No. 850 Logan Manufacturing Turret Lathe

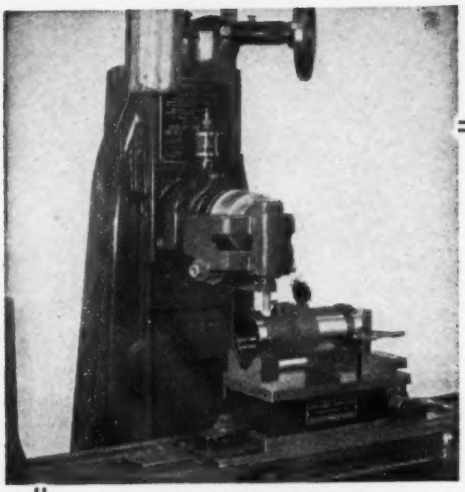
AN ACCURATE TURRET LATHE for SMALL PARTS PRODUCTION

Developed to meet war industry's urgent need for a fine tool capable of continuous production with sustained accuracy, the No. 850 Logan Turret Lathe has surpassed all expectations. Within the limits of its capacity (⅝" round bar stock) it will turn out parts with the same precision, and with equal or greater speed as that of heavier equipment, which can be released for larger work. And, of course, the investment and operating costs are proportionate to its size. *Complete description and specifications on request.*

LOGAN ENGINEERING COMPANY • Chicago, Illinois

Logan

A NAME TO REMEMBER WHEN YOU THINK OF LATHES



VERTICAL ATTACHMENT
Grinding Rectangular Opening in Trigger Casing

NEW! LIBERTY HI-SPEED GRINDING ATTACHMENTS

for quicker set-ups on a wide range of work

Accuracy and speed in grinding angles, slots, recesses and surfaces which are difficult to get at with large wheels or which mean slow set up with small wheels are assured with Liberty Attachments.

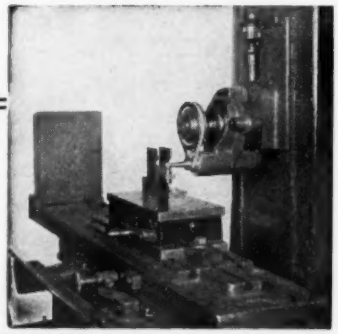
These highly accurate, completely assembled units, with precision bearings throughout, are designed for the most accurate grinding service on gages, tools, dies and other exacting work of this kind. They can be attached quickly and easily and eliminate time ordinarily wasted in set-up on surface grinders.

Made in Horizontal and Vertical types, with any size bores. Pulley belts and grinding wheels furnished at no extra cost. A wide number of grinding positions can be covered. These Liberty units fit Brown & Sharpe, Reid and other makes of surface grinders.

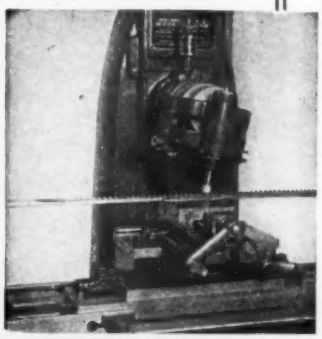
INVESTIGATE TODAY

Write for complete information specifying diameter of spindle head, type and make of grinder.

HORIZONTAL ATTACHMENT
Grinding Gaging Seat on Special Gage



VERTICAL ATTACHMENT
Grinding Clearance of Broach Teeth



LIBERTY
TOOL & GAGE WORKS
241 Georgia Avenue
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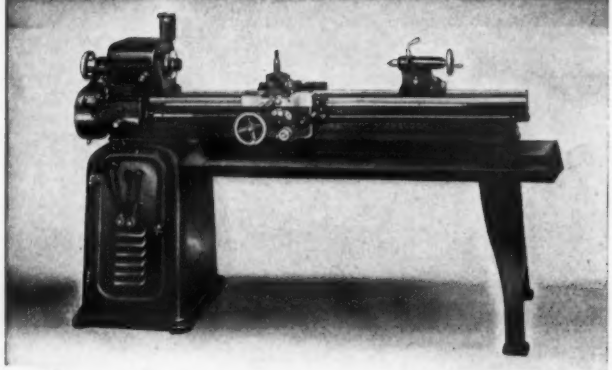
SHELDON



SHELDON BBU-1242 WQ
Precision Lathe

★ This quality 12 in. ball bearing tool room lathe is built for precision work and will retain its accuracy under long and hard usage. It has extra collet capacity (to 1" round), the finest precision ball or roller bearings obtainable, an improved heavy-duty, double wall apron with power cross feed; full quick change gears and full bowl headstock. Its improved Sheldon 4-speed, V-belt, lever-clutch operated, underneath motor drive is entirely enclosed in the pedestal leg and has anti-friction bearings. It is so designed that spindle belts operate thru a *standard* 1-piece bed. This bed is bridge-braced with heavy cross girts and has hand scraped ways—2 V-ways and 2 flat ways.

★ If interested in 10", 11" and 12" quality lathes be sure to see the SHELDON.

SHELDON MACHINE CO., INC.
4234 N. Knox Ave. **Chicago, U.S.A.**

SCHAUER *SPEED LATHES*

• for *Faster Finishing*

BURNISHING • BURRING
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. . . of gears, pinions, pulleys, ball-bearing races and similar parts. Use SCHAUER Speed Lathes for increased production.

Awarded
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"the originators of today's Speed Lathes"

SCHAUER MACHINE COMPANY

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RANDALL & STICKNEY

Universal Gauge

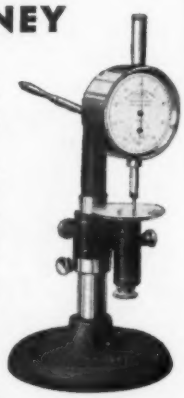
for rigid inspection of a wide range of parts . .

An almost unlimited use is offered by this instrument for inspecting duplicate parts in quantity or any small parts with flat surfaces or recesses.

Use of standard blocks made possible by raising or lowering table increases capacity to take material up to 2" in height. Graduated to read to .001 inch; height 9¾"; weight 5 lbs., 1¼ oz.; depth from frame to spindle 1⅝".

Can be supplied with sliding head and table; also on a stand with throat 3" deep.

Full details on request



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Makers ***Waltham, Mass.***

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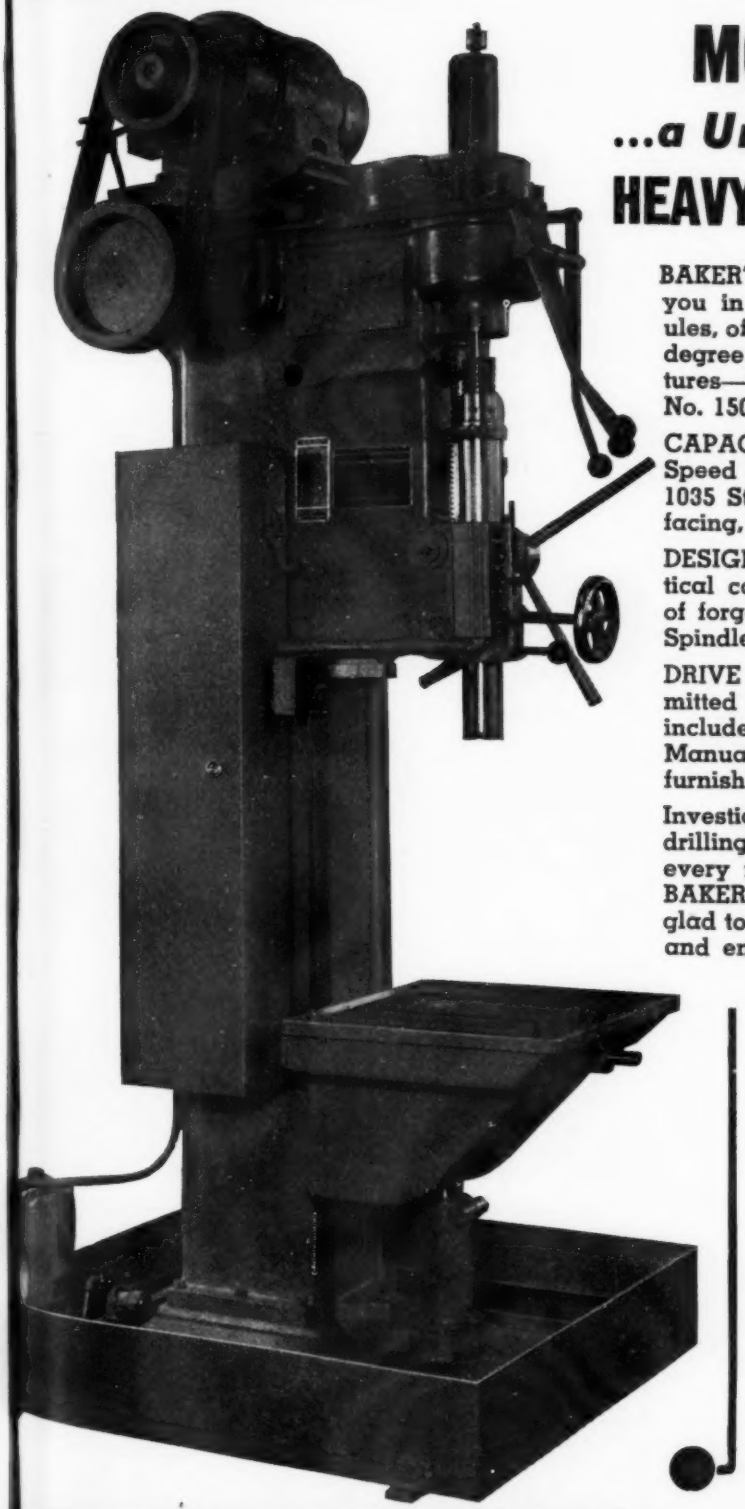

MODEL NO. 150

...a Universal Quick Change Type

HEAVY DUTY DRILLING MACHINE

BAKER'S Model No. 150, specifically designed to aid you in meeting present expanded production schedules, offers more and better production with the highest degree of economy and efficiency. Check these features—you'll agree that this speedy, versatile Model No. 150 is the machine you need.

CAPACITY . . . ample to drive 1½" diameter High Speed Twist Drills to the limit of their efficiency in 1035 Steel. Can be adapted to boring, counterboring, facing, forming and tapping operations.

DESIGN AND CONSTRUCTION . . . incorporates vertical column assembly of 2 piece design. Spindle is of forged high carbon steel—has No. 4 Morse Taper. Spindle end has cross slot for holding tool securely.

DRIVE . . . furnished motor driven only. Power transmitted through multi-vee belts. Standard equipment includes reversing Controller, to permit tapping, and Manual Control with Push Buttons. Machine also furnished in Single Purpose type.

Investigate today . . . BAKER is equipped to furnish drilling, boring and tapping machines to meet your every requirement. Get in touch with your nearest BAKER representative, or write direct to us—we'll be glad to send complete information—descriptive folders and engineering sheets.

BAKER representatives

are at your service in these key cities

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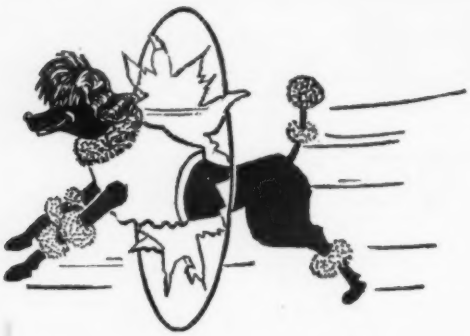
Our Motto Since 1867:
"Machines Sturdy and Efficient, as Fine as Can Be Built..."

DRILLING
BORING
TAPPING

Does the TRICK



. . . of DUST COLLECTING

FOR positive, efficient, and economical dust control — *Torit does the trick.*

Torit Dust Collectors are a portable, self-contained unit, designed for simple installation to grinding, buffing and cutoff machines.

War production demands mean rapid expansion in our factories. Torit Dust Collectors are ideal, as they may be used as auxiliary equipment to large central dust collecting systems already in operation.

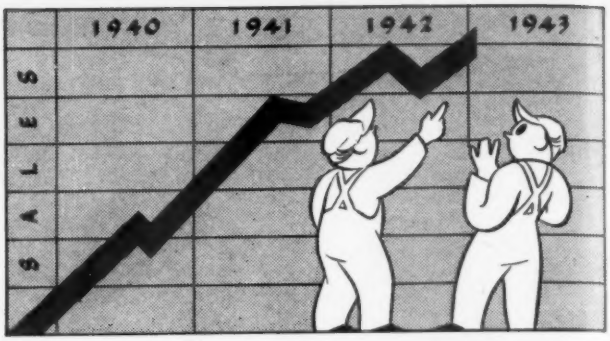
Write today for bulletin giving Torit features, specifications, prices, or give us your "dust problem" and let us recommend a solution, without obligation.

TORIT MANUFACTURING CO.

280 Walnut Street
St. Paul, Minnesota

Traps dust from grinding and Buffing wheels instantly

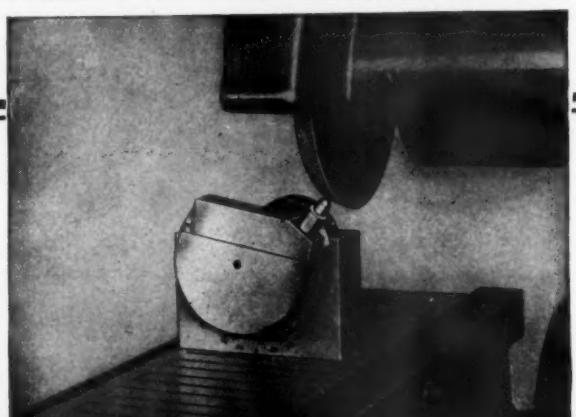
TORIT Dust Collectors
SELF-CONTAINED UNITS



UNIVERSAL GROWS BY LEAPS AND BOUNDS

Production of Universal Drill Bushings has doubled each year over the same preceding period for the last three years — proof that American manufacturers demand the best. Universal bushings have superfinished bores which assure accuracy and unexcelled wearing qualities. Write for complete facts.

UNIVERSAL ENGINEERING CO.
FRANKENMUTH • MICHIGAN



QUICK ANGLE DRESSER

THE Welch Quick Angle Dresser can be set quickly for dressing the grinding wheel to any desired angle. It is compact, durable; simple in construction. All surfaces are hardened and ground. Furnished in plain or Vernier type. Plain dresser graduated in degrees. . . . Vernier reads in degrees and minutes. The Vernier being an integral part of the base block eliminates any possibility of error. 10 DAYS FREE TRIAL IF DESIRED.

Plain Type, $70 Net

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Vernier Type, $82.50 Net

Write for particulars

Welch INDUSTRIES INCORPORATED

Makers of High Speed Milling Cutters . . . Form Tools and Special Tools

20,000 West Eight-Mile Road — Detroit, Michigan

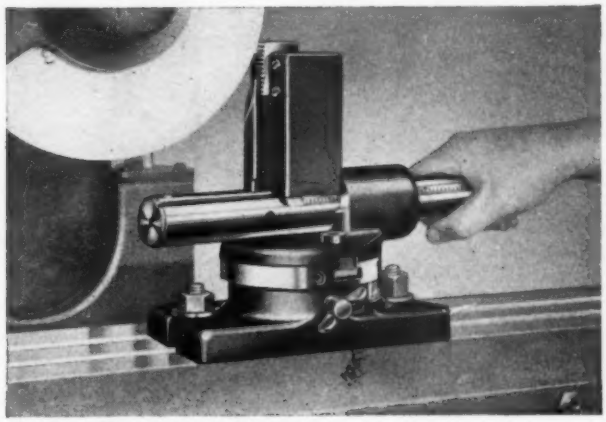
GEOMETRIC Pointers

FOR SAVING HIGH SPEED STEEL

No. 3

SAVE THOSE CHASERS!

Get All the Threads You Can From Every Set



Get all the life you can from every set of Chasers. Resharpen them frequently—before they become dull.

Resharpen Chasers uniformly. The width of land or thickness of cutting edge should be uniform in all Chasers of a set. The chamfers should be of uniform length and clearance.

Do not resharpen Chasers free hand. Buy or make a suitable fixture for holding the Chasers.

Regrind Milled Chasers on the chamfer. Usually you can do all of your resharpening at the chamfer, but once in a while you may have to touch up the cutting face. If you do, take only a light cut:—.002" to .003" should be plenty at one resharpening.

If your Milled Chasers chatter, lap them together to restore the bearing. Lap the opposite Chasers of a set together using fine emery and oil as a lapping medium.

Remember, High Speed steel is scarce. Chasers of High Speed steel are extremely valuable. To waste them may mean the holding up of important weapons of war at a critical time. It may even mean the death of ones dear to you. The Geometric Tool Co., New Haven, Conn.

The Geometric Tool Company is listed on the Treasury Department's Roll of Honor of those companies which contribute at least 10% of their gross payroll for War Bonds. Buy War Bonds each payday! Insure Victory for America now, and financial security for yourself in the future.

GEOMETRIC

SELF-OPENING DIE HEADS
COLLAPSING TAPS
CHASER GRINDING MACHINES

SOLID ADJUSTABLE DIE HEADS
SOLID ADJUSTABLE TAPS
THREADING MACHINES

"Here's a Tip THAT WILL INCREASE YOUR PRODUCTION!"

TECO CARBIDES

...cut at higher speeds

... hold cutting edges longer

...produce more pieces between grinds

... reduce grinding and re-tooling time

THE real "business end" of a carbide tool is the little Carbide Blank. The production you obtain depends entirely upon the cutting ability of this vital carbide.

TECO Carbides are manufactured to rigidly controlled standards of hardness, density and uniformity. Wear and breakage are reduced to a minimum—greatly extending tool life, increasing production and reducing time-outs for tool changes.

The superior cutting qualities of Teco Carbides are available in Tools and Blanks in all grades, sizes and styles for practically every machining need.

Write for your copy of the
NEW TECO CATALOG

Illustrates and gives specifications of all standard TECO Carbide Tools and Blanks for turning, boring, facing and cut-off operations.

TUNGSTEN ELECTRIC CORPORATION
568 39TH STREET, UNION CITY, NEW JERSEY
Branch Office: 2906 Euclid Avenue, Cleveland, Ohio
Representative: Architects & Builders Bldg., Indianapolis, Ind.

TECO CARBIDE TOOLS

Pioneers in Tungsten Carbides for over a Quarter Century

JACOBS

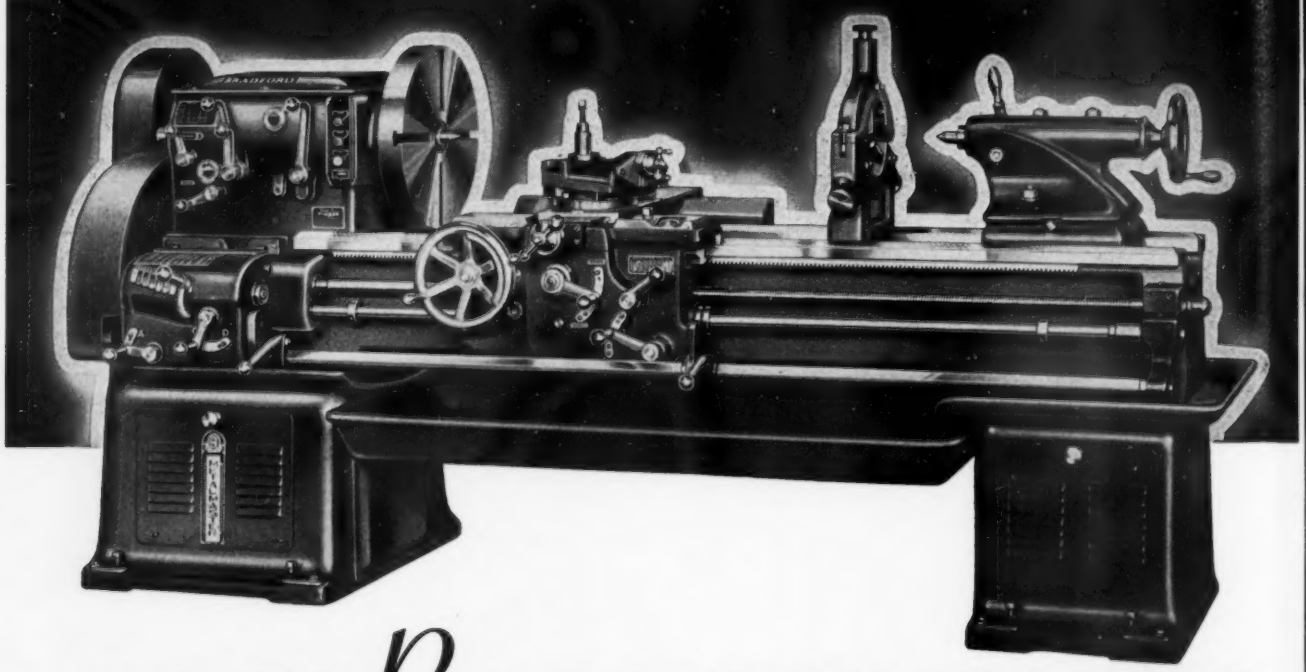
Confidence in Jacobs Chucks is justified by exclusive designs for maximum strength, closer accuracies, powerful grip and long wear. Their unfailing performances assure speed on the production fronts, victory on the battle fronts! The Jacobs Manufacturing Co., Hartford, Conn.

THE NATIONAL STANDARD FOR WAR PRODUCTION

"IF IT'S A JACOBS IT HOLDS!"

W.I. PHOTO

The Metalmaster

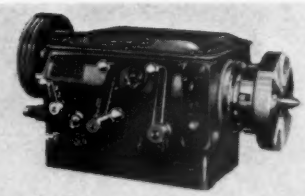


. . . MAXIMUM *Power* UTILIZATION GUARANTEED!

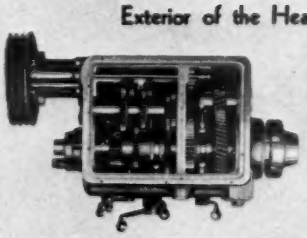
In the METALMASTER, friction losses are all but eliminated through proper application of highest quality precision-fit bearings. Added to this is the smooth, efficient flow of power; delivered to the head by "V" belts, thence to the speed change gears through a multiple disc clutch. Convenient handles operate the clutch—jogging with motor running at high speed is possible with the same handles. The clutch and brake are adjustable from the rear of the clutch housing.

ELECTRICAL PUSH BUTTON CONTROL — properly located in the front of the head; activates all starting, stopping and reversing. All wiring is enclosed in heavy metal conduits, thus there is no danger of contact with "hot" wires. Push button station and magnetic starter is standard equipment.

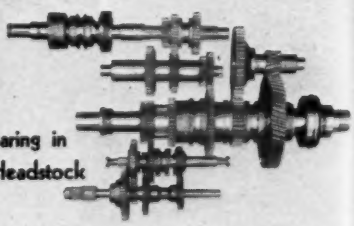
Remember the METALMASTER—foremost in its field. Write to us today — we'll send complete, comprehensive data immediately.



Exterior of the Headstock



Interior of the Headstock



Gearing in the Headstock

The **BRADFORD MACHINE TOOL Co**

MANUFACTURERS OF METAL WORKING LATHES; CAM FEED DRILLING AND TAPPING EQUIPMENT, HYDRAULIC DRILLING MACHINES . . . IN BUSINESS SINCE 1840

659 EVANS AVE. . . . CINCINNATI, OHIO

NOW—24 hours a day—

ALL-OUT PRODUCTION OF

DALZEN TOOLS

TO FILL WAR ORDERS
TO SPEED OUTPUT

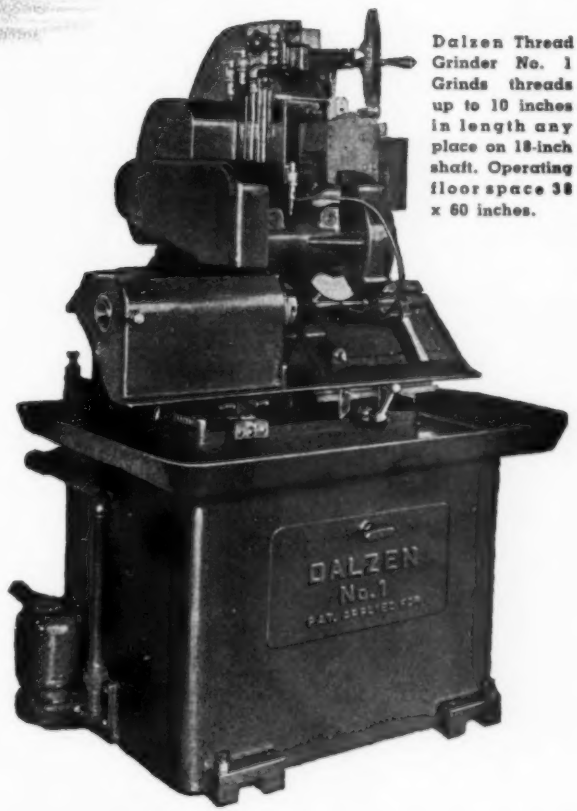
• Dalzen Thread Grinders

Taps • Thread-Milling Hobs and Broaches

mean fast absolute precision

It's significant when we tell you we're producing Dalzens straight around the clock every day—but we've *tripled* our plant to take care of the big demand from industries working on Army, Navy and Air war equipment! That proves that Dalzens can be depended upon for speed plus high precision in grinding threads 4" and 10" in length, right and left hand, in U. S. Standard, modified and British standard and special forms.

Their compactness and vertical design insures constant equilibrium.



Dalzen Thread Grinder No. 1 Grinds threads up to 10 inches in length any place on 18-inch shaft. Operating floor space 38 x 60 inches.

THE DALZEN LINE OF TAPS AND THREAD MILLING HOBS INCLUDES BOTH THE WHITWORTH AND U. S. FORM.

DALZEN ALSO MANUFACTURES ROUND AND FLAT BROACHES.

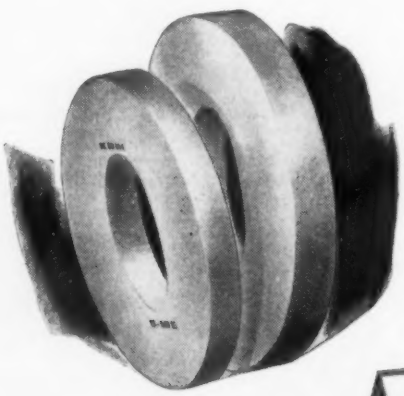
DALZEN TOOL & MFG. CO.

12255 E. 8 Mile Road — Detroit, Mich.

What's the hottest spot in a Dog Fight ?

A pilot may keep cool in a "dog fight"—but not his engine! And to function smoothly at high engine temperatures all moving parts must be ground and finished with split hair precision. And that's where Carborundum comes in. For instance, the valve stems are ground to the required accuracy by a centerless grinding process which Carborundum helped develop.

The centerless grinder grinds the valve stems to an accuracy of five ten-thousandths of an inch. Does it, too, in half the time other finishing methods would require. Carborundum has led in the development of centerless grinding wheels to speed the output of valves, pistons, shafts and other such parts that go into a plane.



Because of the vital part grinding plays in war production, correct care and use of grinding equipment is a wartime must. Every grinding wheel is a "Weapon for Production" and should be properly used for maximum effectiveness. The Carborundum Company, Niagara Falls, New York.

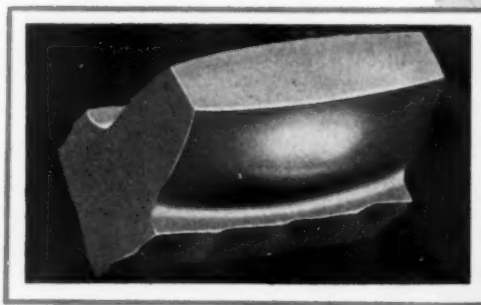
CARBORUNDUM
REG. U.S. PAT. OFF. BRAND
ABRASIVE PRODUCTS

Carborundum is a registered trade-mark of and indicates manufacture by The Carborundum Company.

Advantages of RED RING GEAR TOOTH SHAVING

1. Corrects gear cutting errors of index, helical angle, tooth profile, eccentricity, and tooth roughness.
2. Applicable to spur gears, helical gears, cluster and shoulder gears, and internal gears.
3. Produces a uniform product so that proper allowances may be made for consistent heat treat distortion.
4. Requires only a small fraction of the machining time required by grinding, for the same quality of product.
5. Gears shaved and hardened are free from microscopic cracks in the tooth surfaces such as occur in ground gears.
6. Ground gears must pass a Magnaflux Test in order to discard those having these microscopic cracks which contribute to hazardous failures.
7. Tooth profiles are smooth and free from flats such as produced by some methods of grinding.
8. ELLIPTOID tooth form to eliminate end bearing can be produced at no extra cost.
9. The shaving operation is fully automatic; consequently, no skilled operators are needed.
10. Materially reduces gear noise and improves gear operation.
11. Produces uniformly high quality gears with a minimum of supervision.

MACHINES AVAILABLE FOR GEARS ¼" P.D. TO 96" P.D.



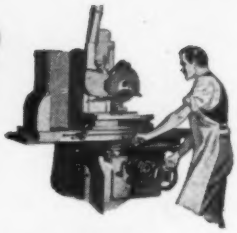
Send for descriptive bulletin on RED RING Crossed Axes Rotary Gear Shaving.

NATIONAL BROACH AND MACHINE CO.
RED RING PRODUCTS
5600 ST. JEAN · DETROIT, MICH.

SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE

ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

To the Skeptic who hasn't yet tried the POR-OS-WAY WHEEL



THE MEN in the armed forces want all you can give them—NOW! You may, as hundreds of war plants have already proved, increase your precision grinding production 2 to 5 times per man per machine with the Por-os-way wheel. Try it!

A YEAR AGO we introduced to industry a new precision grinding wheel. We were confident, after three years' research and scores of actual trials on production work that this new wheel, Por-os-way, would produce 2 to 5 times more work per man per machine. And we said so. At first there were few believers. Our statement seemed incredible. But there was a war to be won. War plants by the score tried Por-os-way, probably with more hope than conviction. They did not fully realize, then, that Por-os-way, being an entirely new kind of wheel, could not be limited by comparison with wheels they had been using.

But skepticism is disappearing. Many operators now *know* that Por-os-way's patented honeycombed structure cools each grinding point between contacts, practically eliminating "burns" in vital war work. Many know that they can double or treble the depth of former cuts and grind in fewer passes of the wheel . . . have seen how the Por-os-way wheel holds its corner and resists "loading", reducing the number of dressings necessary. Many have proved to their own satisfaction that the life of a Por-os-way wheel is at least equal to or better than previous wheels, and know that Por-os-way can produce 2 to 5 times more work per man per machine. But even among Por-os-way's most enthusiastic users, some few are *still not pushing Por-os-way to the limit of its possibilities.* We want you to give this wheel "the whole works." We want you to see for yourself it is all others say it is. Send for "Facts about Por-os-way", with a "prescription blank" for a trial, run to your requirements.

2 TO 5 TIMES MORE WAR PRODUCTION PER MAN PER MACHINE

War plants say, "Tell others what Por-os-way has done for us."

WAR PLANT A—Job: Surfacing oil-hardened, high-speed steel blanks on B & S grinder at 6200 SFPM.

Results: Por-os-way removed .050" in one pass, against .020" previously. Por-os-way wheel lasted 2½ times as long as former wheel, required no dressing, produced no burn, held shape and corner while grinding.

WAR PLANT B—Job: Grinding high-speed cutter tool steel on LeBlond No. 1 at 4750 R.P.M.

Results: Por-os-way increased production 300%. Held a true edge in grinding a *complete* gear cutter. No burning, no loading. Free, cool cutting without dressing. Good finish.

WAR PLANT C—Job: Internal wet grinding on Bryant 16-A machine at 8946 R. P. M. on hardened tool steel—SAE 41/50. Precision grinding.

Results: Obtained 400% better production. Cut fast, free, and cool. Diamond dressed only occasionally to retain shape.

POR-OS-WAY* a new RADIAC* PRODUCT

A. P. DE SANNO & SON, INC.
NEW YORK, CHICAGO, PITTSBURGH, CLEVELAND, DETROIT, LOS ANGELES

PHOENIXVILLE, PENNA.
Western Gateway to VALLEY FORGE

*T. M. Reg. U. S. Pat. Off.

COPYRIGHT, 1943, A. P. de Sanno & Son, Inc.

THIS ABOVE ALL*

To liquidate the Hun, to vanquish the armed minions of the Rising (?) Sun, to achieve the spiritual ideals of Democracy—these objectives require a potent **Something,** too fine, too big to be confined within the boundaries of human selfishness.

SELFLESSNESS seems to be the word that best expresses it. Impossible? Perhaps. But here at the Gairing Plant we at least have reason to believe we are on the way toward attaining it.

The skilled craftsmen who man our plant, office staff, salesmen, engineers, management—**WORKERS ALL**—devote from 10 to 35 per cent of their pay checks to the purchase of War Bonds. Here, all are bent on backing our brave fighters by producing the finest metal cutting tools in the greatest possible volume—and investing all our loose dollars in the Bonds that make Victory possible.

THE GAIRING TOOL COMPANY, Detroit, Michigan

**This above all: To thine own self be true*
And it must follow as the night the day
Thou canst not then be false to any man.
—SHAKESPEARE, *Hamlet*

GAIRING
FOR OVER A QUARTER CENTURY SPECIALISTS IN FINE CUTTING TOOLS

Manufacturers of Standard, Special and Gair-Lock Inserted Blade Cutting Tools

GRINDING TIME CUT IN ½ with MATTISON GRINDERS

28 Gears per table load..compared to 6

4 Lathe Slides per table load . . . compared to 1

4 TIMES AS MANY SMALL PARTS PER LOAD BECAUSE OF GREATER GRINDING AREA

At the Sundstrand Machine Tool Company, grinding time on small parts has been cut in half with their Mattison High-Powered Precision Surface Grinder. One reason for this substantial saving in grinding time is the greater load and grinding area of their Mattison Grinder. To illustrate — gear parts shown on the above machine were formerly ground 6 pieces per load. With the Mattison Grinder, 28 pieces are ground simultaneously. Similarly the Lathe Slides were formerly ground one at a time. With the Mattison — 4 pieces can be held in the grinding area. Both of these jobs are held to within limits of a few tenths. On numerous other small parts similar results are obtained. Double column construction for the wheel slide assembly and other construction features enable users of Mattison Surface Grinders to get repeated precision results on a high production basis. Machines are offered in a wide variety of sizes to meet every requirement from 12″ to 36″ wide by 36″ to 192″ long. Write for the free Set-Up Book, containing further examples, showing how others have reduced time and increased production with Mattison Grinders.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

DO YOU KNOW 'THE HOVIS WAY' OF MAKING WASHERS

• Here are 5 Reasons Why You'll Save Materials and Money by Making Washers "The Hovis Way."

1. HOVIS MASTER Dies using interchangeable parts, make any number of different washers, thus eliminate special washer dies.
2. HOVIS Dies save the *expense* of ordering washers independently and keeping large inventories on hand.
3. HOVIS Dies give you the facilities to make washers on short order, as you need them . . . no costly delays are necessary.
4. HOVIS Dies save the materials that would normally be used to make dies for each separate washer.
5. HOVIS Dies save labor costs by eliminating the work of making new dies for new washers.

WANT DETAILS? . . . . SEND FOR NEW ILLUSTRATED FOLDER

HOVIS

SCREWLOCK CO

8098 E. Nine Mile Road

Van Dyke Michigan

Suburb of Detroit - Phone Centerline 1575

HOVIS SCREWLOCK COMPANY
8098 E. Nine Mile Road, Van Dyke, Michigan

Please send me your new illustrated folder showing "The HOVIS WAY" of making washers.

My name is .....

Company .....

Address .....

City ..... State .....

DIES ARE INVESTMENTS

Moore Jig-Grinding of Holes Produces Dies of Longer Life at Less Cost

A jig-ground die is always the best investment! Experience has shown that grinding after hardening *increases* die life and *eliminates* die failures, thus lowering die costs.

Grinding holes, both straight and tapered, to size and location with the Moore Jig Grinder results in greater accuracy and more uniform clearance between punch and die...the finish is smoother and the decarbonized surface of the steel is removed.

In addition, the Jig Grinder, a new-type machine created specifically by Moore tool-and-die specialists to solve the bugaboo of hardening distortion, will do the work in one-third the time required by previous costly, highly skilled and, at best, makeshift methods. Without a Moore Jig Grinder, the holes in a multiple-station die would have to be ground one section at a time and then each section accurately assembled in the die bed.

With a Moore Jig Grinder, all the sections can be screwed and doweled into place, put on the machine and ground in one setting, depending *entirely* on the Jig Grinder for location. This eliminates hours of checking and measuring on the bench and surface plate, where the die-maker, under the best of conditions, cannot possibly work as closely as the Jig Grinder.

PARTNERS IN PRODUCTION • Moore Jig Borer bores the holes in the die sections before hardening, thus holding the location as close as possible to eliminate excessive grinding. Send for literature on how both machines will modernize your toolroom operations.

MOORE TOOLS

Manufactured by MOORE SPECIAL TOOL CO., INC • Bridgeport, Conn.

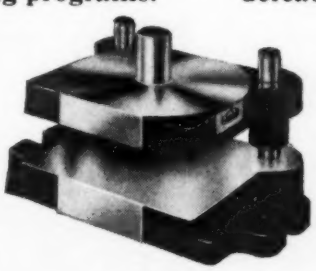
EXCLUSIVE DISTRIBUTORS: MARBURG BROTHERS, INC • 90 WEST ST., NEW YORK, N.Y.

AXIS of WHAT?

Axis of defeat for Germany, Italy, and Japan, is the idea of those workers at Danly now engaged 100% on war production. Die sets are this company's principal product. Die sets are being made in capacity quantities, in 3 shift, 24 hour, continuous operation to enable other American people to meet their tooling programs.

This company, as prime and sub-contractor, has also taken on the difficult task assignment of producing weldments of extreme accuracy, both as to welding and machining.

That task assignment is being carried out, for the defense of America and the defeat of the Axis.

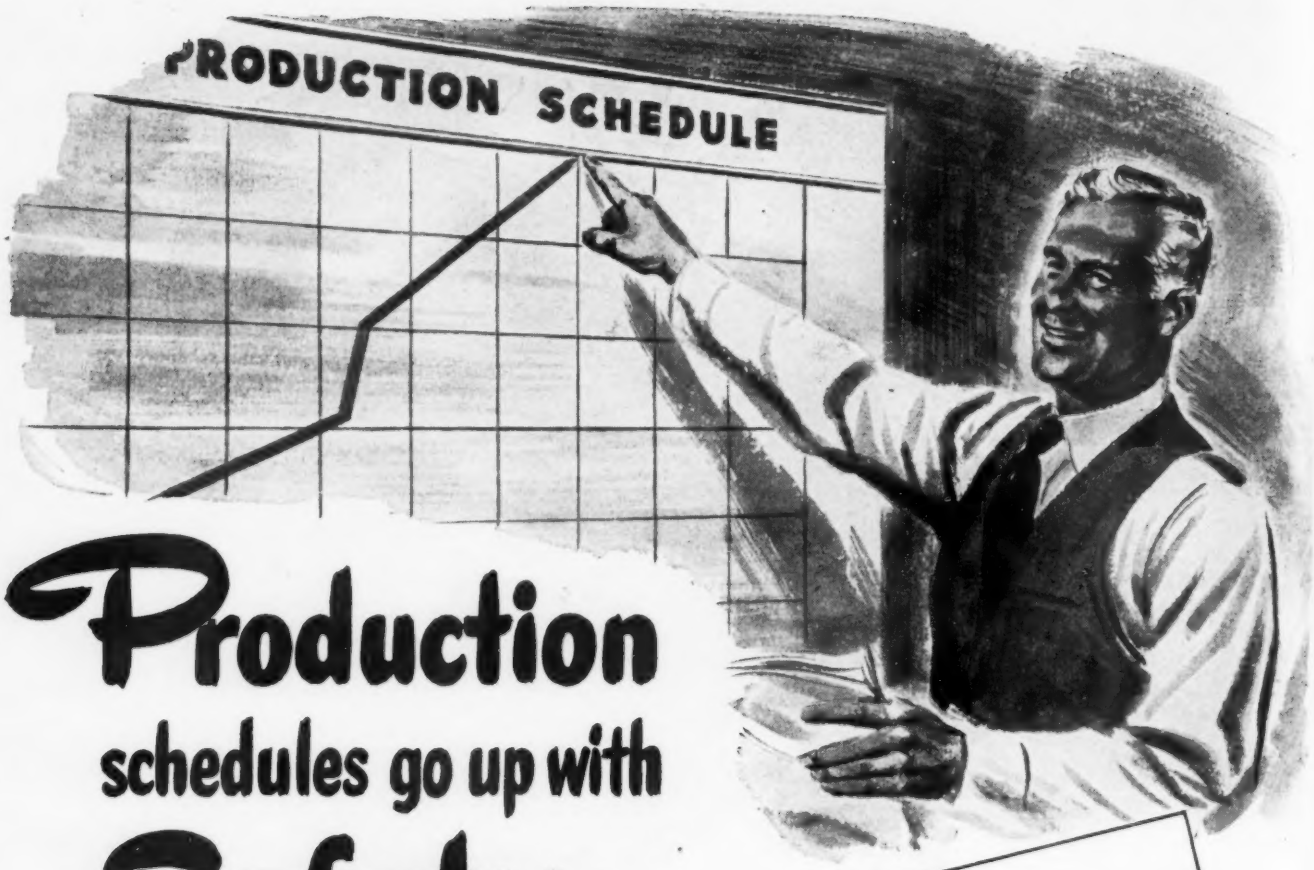


DANLY DIE SETS

WELDED STEEL FABRICATION

DANLY MACHINE SPECIALTIES, INC.
2100 SOUTH 52nd AVENUE • CHICAGO, ILLINOIS

MILWAUKEE • DAYTON • ROCHESTER • LONG ISLAND CITY • DETROIT • CLEVELAND
PHILADELPHIA • • • • • • DUCOMMUN METALS & SUPPLY COMPANY, LOS ANGELES



Production schedules go up with Safety----

Safety Grinders and Grinding Wheels insure higher accuracy in production for light, heavy, or close work, and are built to maintain high levels of production in grinding aluminum, cast iron, steel castings and welds.

Safety Grinders and Grinding Wheels are accepted for their continuous and dependable operation over a long period of high-speed production time.

If facing an increased production problem, outline your specific situation, and we will tell you whether we can help you. Wheels for your trial and approval will be gladly sent.

GRINDING WHEELS
Grip-Lok

RITE-SPEED GRINDERS

PORTABLE GRINDERS
Motor Driven

SAFETY

THE SAFETY GRINDING WHEEL AND MACHINE COMPANY

SPRINGFIELD, OHIO — SALES OFFICES IN PRINCIPAL CITIES — ESTABLISHED IN 1892

MANUFACTURERS OF SAFETY MOTOR DRIVEN PORTABLE GRINDERS, SAFETY RITE-SPEED GRINDERS, GRINDING WHEELS FOR EVERY PURPOSE, INCLUDING THE FAMOUS "SAFETY GRIP-LOK GRINDING WHEELS"

★ IT'S ALL THE SAME TO THE DoAll SPECIAL PARTS OR 24 HOUR PRODUCTION

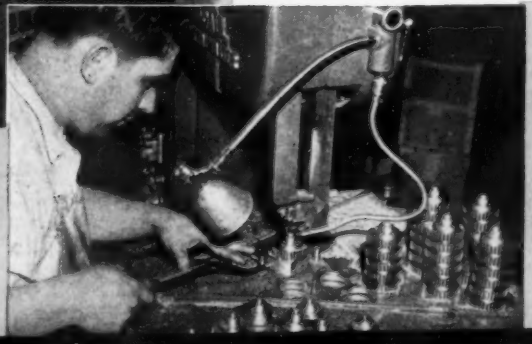
A battery of DoAlls in the production line of a large aircraft plant.

• The DoAll is doing its bit—and a very big bit—wherever metals, alloys or plymetals are cut and shaped.

Steady streams of parts for guns, jeeps, planes, trucks, tanks, flow over its work table. Anything from a 2000 lb. gun slide to a 2-ounce instrument part—15 ft. channel forms, blocks a foot square, all kinds of molds, dies and liners, form tools, gauges, machine parts.

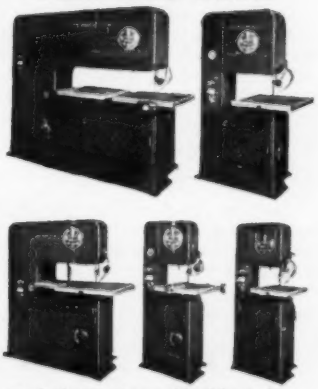
DoAll follows a straight line with precision accuracy—follows any contour design and gives a smooth finish requiring no further machining—does internal and external sawing, filing, polishing.

Making special dies is easy and quick on the DoAll.



DoAll cuts out sector gears in 5 min. each. Former method 30 minutes.

THE BIG FIVE



DoAll Contour Machines for rapid internal or external sawing and filing of any kind of metal or alloy. Priced from $1,000 to $5,000, each model with motor.

FASTEST METAL CUTTING METHOD

Because of its speedy, accurate performance, a great deal of shaper, milling and lathe work is switched to the DoAll. Time schedules are whittled down to astonishing new lows. A day's work in an hour—an hour's work in ten minutes—these are typical DoAll results.

LET US SHOW YOU

A factory trained man will call with a DoAll and demonstrate many amazing metal sawing short cuts on your own work.

WRITE FOR THIS BOOK

"DoAll on Production," a picture story of performance in many different plants. Interesting and informative.

CONTINENTAL MACHINES, INC.

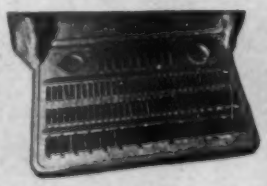
1310 S. Washington Ave., Minneapolis, Minn.

Local DoAll offices distribute these machines. They also sell and service DoAll Grinders, Gage Blocks, Band Saws and Files. Parts and Accessories. See Telephone Directory for nearest DoAll office.

DoAll Grinder

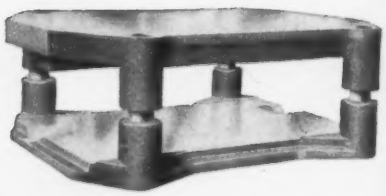
Finest made for high precision surface grinding. Adaptable to wet or dry grinding.

DoAll Gage Blocks



$1 to each set. Come in 3 accuracies: Working Set, 8 millionths of an inch, $295.00
Inspection Set, 4 millionths of an inch, $350.00

PRODUCTO RENDERS PROMPT SERVICE TO PRODUCTION



DIE SETS

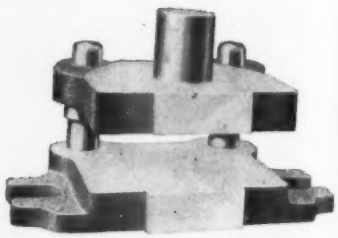
Tooling and production can be speeded up by taking advantage of Producto's manufacturing and distribution facilities whereby Master and Standard Die Sets or Special, Semi-Steel or Steel units are quickly available in every important metal-working center. Die makers' accessories including Dowel Pins, Stripper Bolts, Bolster Plates are also available promptly.

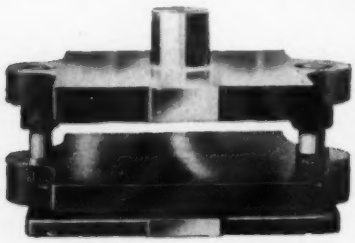
To insure prompt service to production, assembly and warehouse facilities are maintained at Bridgeport, Conn., Detroit, Mich., and Cleveland, Ohio and Los Angeles, Cal. Midwestern areas are served from Detroit, Mich., by motor truck.

The Die Supply Co., 4747 Hough Ave., Cleveland, Ohio, serves Ohio, western Pennsylvania, and West Virginia.

West Coast users can obtain Die Sets and Accessories for prompt shipment from Jamison Steel Corporation, 2160 E. Olympic Boulevard, Los Angeles, California and 500 Fourth Street, San Francisco, California.

Write for the Producto Catalog #9-A giving details of Die Sets and Die Makers Accessories.



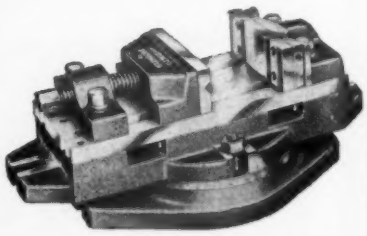


MACHINE VISES

These accurate, tight gripping, long lived vises have bodies of semi-steel and hardened holding surfaces. Jaws adjustable to any desired position provide extra large opening. Made in heavy duty and general purpose milling and drilling types. Sizes: Screw Action 4½ and 6"; Cam Lock Production Milling Vises 4", 5" and 7". Descriptive bulletin available on request.

Self-Centering Shaft Vise

This new design of Vise is indispensable in all Machine Shops for any machining operations on shafts or spindles. This Vise clamps and centralizes the work properly regardless of diameter. Holds work up to 3½" diameter. Ask for bulletin.



UTILITY PRESS

The Producto Utility Press ensures speed and easy operation on a wide range of shop or tool room work. It is fast, powerful, convenient and sturdy. Full details on request.

THE PRODUCTO MACHINE COMPANY

990 Housatonic Ave. BRIDGEPORT, CONN. 3017 Medbury Ave. DETROIT, MICHIGAN

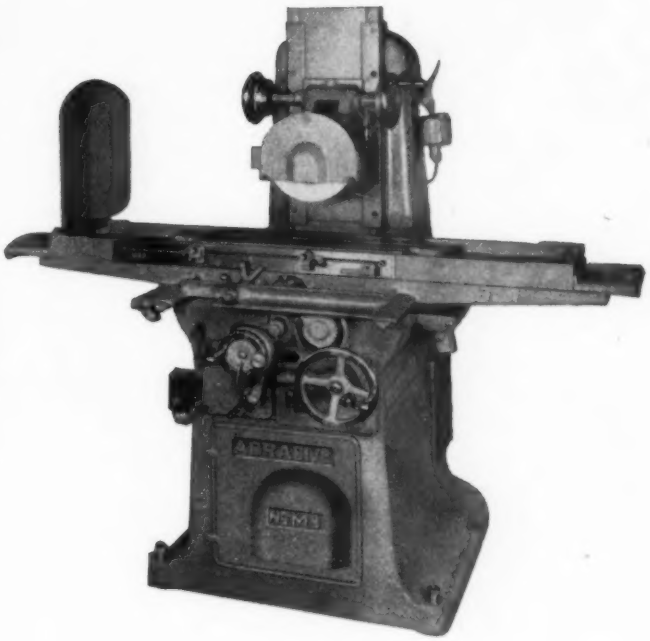
Distributors of Dickerman Automatic Press Feeds

ABRASIVE No. M3 SURFACE GRINDER

MOTORIZED SPINDLE

For Full Power and Precision

The Abrasive No. M3 combines the motorized spindle so successfully employed on the No. 1½ hand operated grinder with the full automatic feeds of the popular No. 3B. The resulting machine is proving highly satisfactory on many types of work and many customers have reordered



Fast•Accurate•Carefully Engineered

The dynamically balanced rotor is mounted directly on the wheel spindle . . . of ball or plain bearing type . . . and delivers full motor power to the wheel without vibration. Belts, chains and sprockets are eliminated. A separate ½ h.p. motor in base of machine drives longitudinal and transverse feeds.

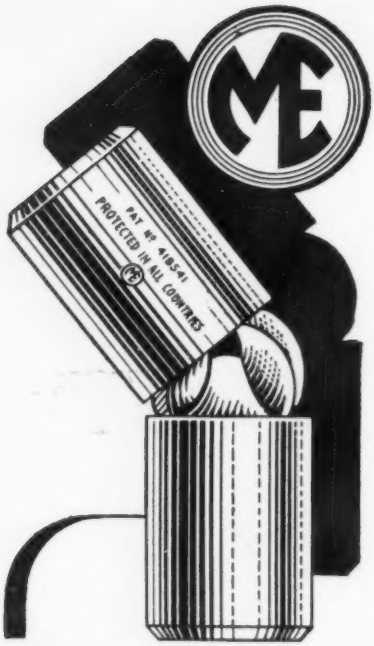
For Better Delivery Order the M3

Owing to the fact that the M3 Surface Grinder has only recently been made generally available, deliveries are today months in advance of the 3B.

ABRASIVE MACHINE TOOL COMPANY

Dealers in Principal Cities

EAST PROVIDENCE · · · RHODE ISLAND



Patent

UNIVERSAL BALL JOINTS

- Made in a range of 9 sizes for shaft diameters ¼" to 1⅛".
- Standard Joints have maximum angle of 38° from the straight line.
- Made by the largest manufacturers of UNIVERSAL JOINTS in Great Britain.
- Widely used in Machine Tools, accessory drives and on Aircraft.
- Certified 92% to 98% efficient by the British Government's National Physical Laboratory.

Catalogues on request.

The
MOLLART
Engineering Co., Ltd.

KINGSTON BY-PASS, SURBITON,
SURREY, ENGLAND.

Telegrams: PRECISION, SURBITON.

We invite a forward-looking

MACHINERY MANUFACTURER or INVENTOR

to plan with us NOW for post-war expansion

War work has caused us to greatly increase our productive capacity. So when peace comes, we will have the equipment and trained personnel to manufacture not only our regular line of wrapping machines, but other types of machinery or devices. You may find it profitable to take part in our planning for such post-war expansion.

For 30 years we have been one of the leading makers of packaging machinery. Our machines are used by hundreds of concerns—in the food, drug, candy, tobacco, dairy fields, etc. Many of the advancements in mechanical wrapping now widely used were conceived by our Engineering and Designing Department.

For war, we have *designed and built* large groups of armament machines such as cartridge loaders, cartridge-clip loaders, machines to insert cartridges into cartons, linking machines for machine-gun bullets, etc.

We are now working on ideas to expand our regular line of wrapping machines and to add other lines of machines used by industries we do not now serve.

● You may have ideas for new machinery which need development. We will be glad to discuss them with you, and if mutually satisfactory, will develop them with you.

● You may have a machine or machines which you have been making in your own plant, but which might be improved and made with greater profit in ours.

Final arrangements may result in your coming into our Company—or may be worked out on some other desirable basis.

If you feel that you have something on which we might work together, we suggest that you communicate with us, giving full particulars. We can then arrange for a meeting.

PACKAGE MACHINERY COMPANY • Springfield, Mass.

★*Most Readers*

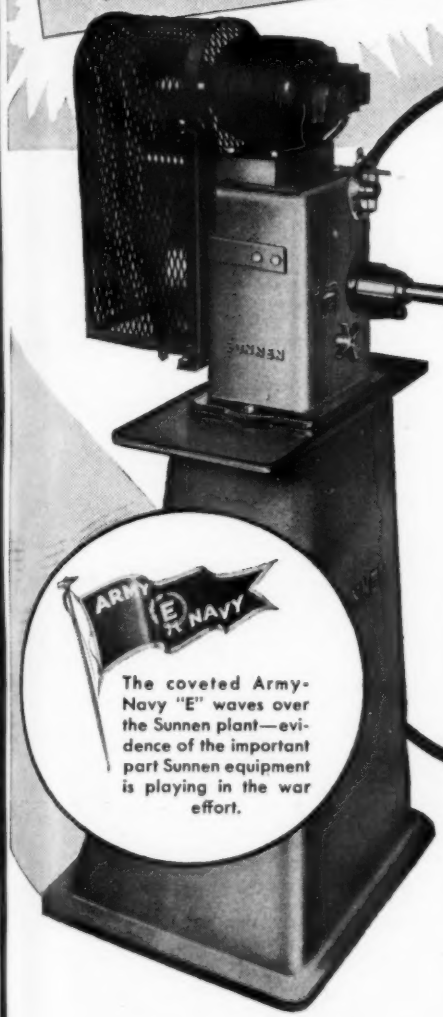
IN AMERICAN MACHINIST HISTORY

Current issues of American Machinist are read by more Metal-Working management and production executives than at any time in the publication's 65-year history . . . American Machinist has several thousand more subscribers than any other Metal-Working publication.

It's That LAST OPERATION

OF THE SUNNEN PRECISION HONING MACHINE

that provides ACCURACY ★ INTERCHANGEABILITY ★ SUPER-SMOOTH FINISH



The coveted Army-Navy "E" waves over the Sunnen plant—evidence of the important part Sunnen equipment is playing in the war effort.

All of the care and skill used in previous operations — all of the vital materials used and the precious man-hours invested — are subject to costly waste if *that last operation* of honing or finishing is not one of dependable accuracy.

That's the reason why manufacturers of precious combat equipment and munitions have been quick to adopt Sunnen Precision Honing.

For here — in a small, inexpensive, economical-to-operate piece of equipment is the method that assures interchangeability of parts and fewer rejects, thanks to a guaranteed accuracy of .0001" and a super-smooth finish of 2 to 3 micro inches.

Versatile is the word for it — for this machine will handle any internal diameter from .185" to 2.400". No jigs or fixtures necessary. Can be set up in less than a minute. Skilled labor not needed — girls can be trained to handle jobs in "tenths" in a few hours' time.

A Sunnen engineer will gladly call and show you what Sunnen equipment can do on your job. Or write for free bulletin giving complete information.

SUNNEN PRODUCTS CO., 7941 Manchester Ave., St. Louis, Mo.

Canadian Factory: Chatham, Ontario

SUNNEN

Hardened Steel Inner Bearing Race honed to .00005" limit. Surface finish improved; errors of out-of-roundness eliminated.

Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."

"Strict alignment maintained between two holes."

Drill Jig Bushing "Increases sales appeal of product."

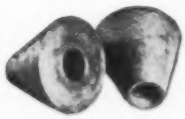
Aluminum Aircraft Link "produces high finish without bell-mouthing."

Inner Bearing Ring "Accurately removes last 'tenth' of stock."

Aircraft Valve Tappet Roller. 4-Micro finish.

Drawing and Blanking Die "Saves time in producing smooth base metal finish."

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.



Cones for Wheel Balancing Machine "Accurately align hones two interrupted surfaces."

We specialize in diamond tools for all makes and sizes of grinding wheels and invite your inquiries regarding your own particular requirements.

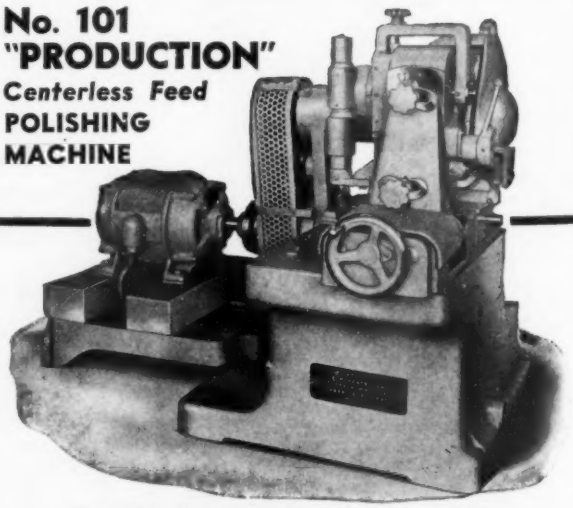
Ample Factory facilities in Boston and Detroit make it possible to render quick deliveries. Write for further information today.

F. F. GILMORE & CO. 285 Columbus Avenue, Boston, Mass.
2834 East Grand Blvd., Detroit, Michigan

BLADES FOR CENTERLESS GRINDERS
. . . TIPPED WITH TUNGSTEN CARBIDE
Assure Greater Production and Accuracy in the finish grinding of bullet cores, armor-piercing shot, shells, projectiles, tank parts, aircraft engine parts, rifle and machine gun parts.
TALIDE

METAL CARBIDES CORPORATION
YOUNGSTOWN, OHIO

No. 101 "PRODUCTION"
Centerless Feed
POLISHING MACHINE



. . . for high speed polishing of cylindrical work of all kinds

This machine offers big time-savings because no centering, chucking or holding are required, and work is fed automatically. It is particularly adaptable for polishing the outside diameter of tubes, rods, bars and similar cylindrical work. Better work in less time is assured by this machine.

Modern in every feature, this machine is equipped with self-aligning ball bearing mounted shaft, triple V-belt drive, quick adjustment of feed for various work diameters and provision for trueing wheels while in motion.

Send for bulletin giving full details.

PRODUCTION MACHINE CO.
Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.
GREENFIELD, MASS., U. S. A.

Well-known manufacturer producing ball bearing assemblies . . . Flat surfaces of inner and outer retaining rings to be furnished with a surface finish within 5 Microinches . . . Then—specifications suddenly changed to 2 Microinches, and without introducing new operations, the best surface finish that the company could grind was 3.5!

When our engineers arrived the company was lapping and polishing these surfaces—*and rapidly falling behind in production.*

NOW··they're GRINDING

these surfaces to .85 - 1.3 MICROINCH SURFACE FINISH, *using* CORTLAND CHUCKS AND SEGMENTS

Work called for grinding the flat surfaces on 5" O.D. ball bearing rings. Equipment consisted of Blanchard No. 18 Vertical Surface Grinder with rotary table. In our production tests we used 18" Cortland Segmental Chuck with four segments, as illustrated. These tests soon established the following record:

Rate of Feed	.016
Table R.P.M.	25.0
Total Feed	.002
Stock Removed	.001
Wheel Wear	.001
Dressings	none
Profilometer Reading	**.85 to 1.3 Microinch surface finish**

The company is now grinding all flat surfaces well within the required 2 Microinch surface finish, using their regular grinding machines equipped with Cortland Chucks and Segments, and is maintaining a high production schedule.

This is but one of a great many successful case histories proving that the principle of *Diagonal Shearing,* as embodied in the design of Cortland Segments and Chuck assemblies, is improving and speeding grinding output wherever a segmental chuck can be used. Write for Segmental Chuck Bulletin—free—and for information on grinding wheels of all types.

DIAGONAL SHEARING
Shock and resistance minimized as narrow end of segment starts grinding action. Large surface still exposed to coolant. Diagonal motion of straight inner edge of segment produces powerful shearing action. Increasing contact combines rapid stock removal with minimum heating.
Maximum area of segment in contact with work momentarily. As segment continues to pass across work, grinding area becomes smaller, with more surface exposed to coolant.

CORTLAND *Segmental Chucks*

CORTLAND GRINDING WHEELS CORP. • CHESTER, MASS.

FLEXPEDITE

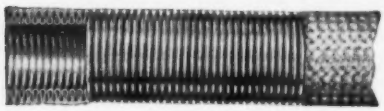
Your Conversion—Assembly—Production

with

REX-WELD

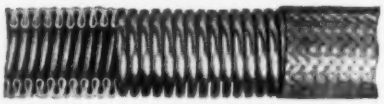
Flexible Metal Hose

Rex-Weld Hose—Annular Corrugations



RW-80 Unbraided ——— RW-81 Braided

Rex-Weld Hose—Helical Corrugations



RW-90 Unbraided ——— RW-91 Braided

General Data

	STEEL	BRONZE
Sizes	To 4" I.D.	To 4" I.D.
Pressures	To 14,500 p.s.i.	To 14,500 p.s.i.
Temperatures	To 1000° F	To 450° F.
Lengths	To 50′	To 50′

Use Chart

	*STEEL	BRONZE
Saturated Steam		✓
Superheated Steam	✓	
Sulphur Bearing Oil	✓	
Oxygen		✓
Ammonia	✓	
Carbon Dioxide	✓	
Sulphur Bearing Grease	✓	
Critical Vibration		✓
Non-Sparking		✓

Protective Coatings Can Be Applied for Corrosion Protection (To Conserve Critical Copper Bearing Alloys).

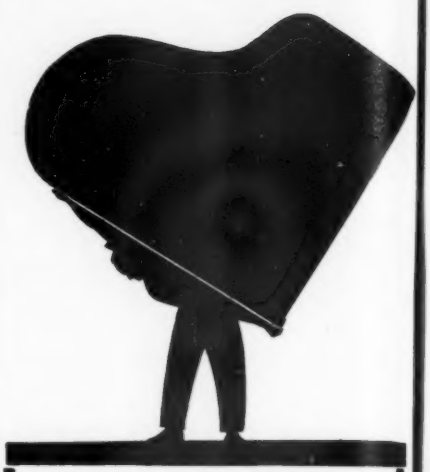
Couplings: REX-TITE Mechanical (Re-attachable) Couplings; Solder Couplings; Brazed and Welded Couplings and Flange Assemblies for Rex-Weld Flexible Metal Hose.

Ask for Engineering Recommendations

CHICAGO METAL HOSE CORPORATION

General Offices: MAYWOOD, ILLINOIS

Factories: Maywood and Elgin, Ill.



MOVING?

If you plan to change the address to which your copies of *American Machinist* are sent, let us know now. We don't—and we're sure *you* don't—want a single issue to be delayed in reaching you. Coupon below for your convenience.

AMERICAN MACHINIST

330 W. 42 St., New York

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Title .....

Company .....

Address .....

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MY NEW ADDRESS

Name .....

Title .....

Company .....

Address .....

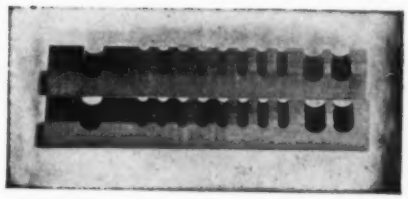
.....

DRESSING IS SIMPLIFIED . . . *by the New Time-saving C-66 . . .* RADIUS DRESSER FOR SURFACE GRINDERS

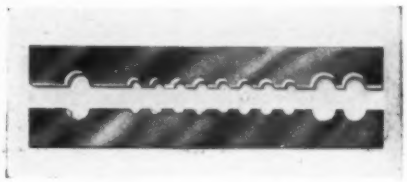
This low-priced, rugged attachment, for any make of surface grinder, dresses wheel without dismantling machine. Mounts directly on magnetic chuck. Does a one hour job in 10 minutes—accurately—conveniently.

NOTE how this Radius Dresser and two High Speed Tool bits replace an expensive Jig Boring Machine.

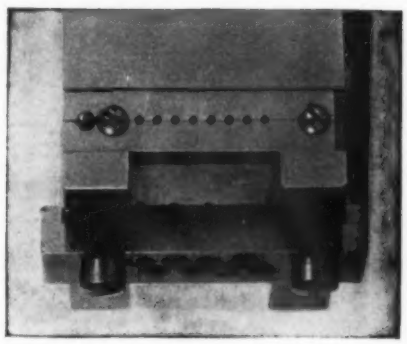
Drill Jig made with two high speed tool bits ground together on surface grinder, eight .062 holes, two screw holes, one dowel pin-hole. No drill bushings, no lapping, no hardening. Grinding time two hours fifteen minutes. Simple, easy, quick.



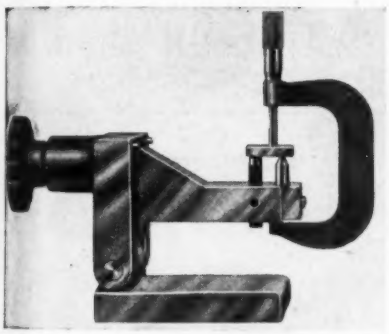
Two High Speed Tool Bits ground for drill jig.



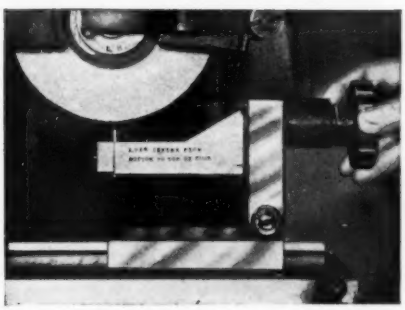
Drill Jig ready to assemble.



Drill jig completely assembled.



The diamond is set by simply measuring with micrometer from top of hood to bottom of arm.



The C-66 provides an important safety feature in that hands are kept away from under the wheel.

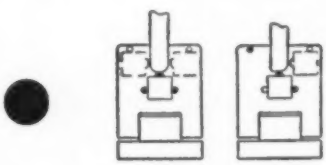
The diamond holder is held against a ground vee in the arm. By means of this construction any size diamond up to ⅜" can be held accurately in line with the vertical center line of spindle.

For dressing wheels for grinding turning tools, the dresser is set at angle equal to clearance angle of tools. The C-66 is the only radius dresser with this feature.

Long Wearing Chisel Point Diamond

.013 Male and Female Radius

.500 Male and Female Radius



180° and 90° Male Dressing

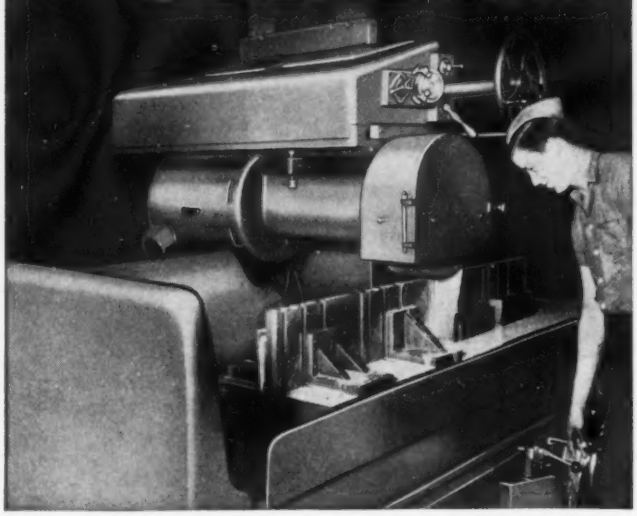
Prompt delivery from factory in Newark, N. J. Price, without diamond, $82.50, ¼ K diamond, $5.00.

SCHULTZ & ANDERSON CO.

MACHINE TOOLS

109 C EDISON PLACE NEWARK, N. J.

PRECISION GRINDING



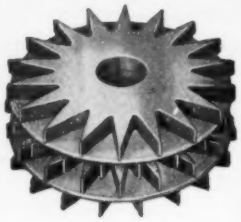
"A fine degree of accuracy is absolutely necessary"

That is the kind of finish grinding specified by The National Acme Co. on tool slides for their Acme-Gridley multiple spindle automatics and that is the kind of ground finish achieved with their HILL *"Open Side"* Horizontal Spindle Hydraulic Surface Grinder. Notice that the tool slides are finish ground in "gangs", for speed and uniformity. The extremely close tolerances held by the HILL Hydraulic Grinder insures precision operation of the finished part in the complex mechanism of these automatics. An inquiry from you on your rough or finish grinding problems will receive prompt attention. No obligation, of course!

The HILL ACME Co.

6400 BREAKWATER AVE. • CLEVELAND, OHIO

HILL *"Open Side"* Surface Grinders are built in both Horizontal Spindle and Vertical Spindle types in a full range of sizes with table dimensions 18", 24", or 30" wide and 5 to 20 feet long.



DESMOND

GRINDING WHEEL DRESSERS & CUTTERS

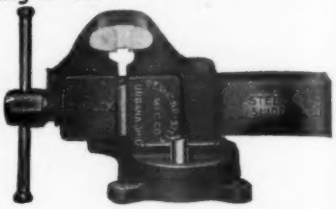
We manufacture a complete line of wheel truing tools and can supply the proper dresser for each of your grinding wheels.

SIMPLEX

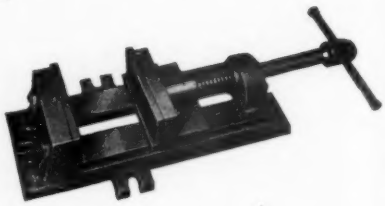
Steel Slide

VISES

A full line of Machinists, Welders, Filers, Production and Drill Press & Milling Machine Vises with solid steel slides.



Write for copy of catalog "A" and name of your nearest dealer who can supply you.



THE DESMOND-STEPHAN MFG. CO.

URBANA, OHIO

GRAND RAPIDS

No. 15
MOTOR DRIVEN SURFACE GRINDER
HAND FEED

FOR SMALL DELICATE JOBS.

6 x 18" Capacity
1½ H.P. Motor
10 x 1" Wheel

Reasonably Prompt Delivery

Many manufacturers on war work are using large batteries of these grinders.

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GALLMEYER & LIVINGSTON CO.

330 Straight Ave. S. W.

GRAND RAPIDS MICHIGAN

KEEP YOUR TOOLS *Sharp* FOR MAXIMUM WAR PRODUCTION

It's vitally important to keep all your tools cutting with maximum efficiency and accuracy—if you are to do your full share in the Battle of Production. Virtually a "toolroom" in itself the Oliver ACE Tool and Cutter Grinder can simplify and speed up your tool conditioning jobs. Among the tools which this versatile tool conditioner can grind are:

Face Mills up to 15" in diameter, Slitting Saws, End Mills, Angular Cutters, Dovetail Cutters, Slab Mills, Spot Facers, Side Mills, Formed Cutters, Reamers, Taper Reamers, Spiral Taper Reamers, Gear Cutters, Double Angle Cutters, Fellows Helical Gear Cutters . . . and many more. On the Oliver ACE the principle of grinding is reversed; the tool is held stationary and the grinding wheel traverses the work. The wheel has a travel of 10" through a rack and gear and a 15" bearing, all fully protected from dust and grit. The two complete fixtures which are supplied are all that are necessary for a majority of tools. Simple, inexpensive special fixtures broaden still further the range of work which the ACE will perform. Truly a universal machine, the ACE Tool and Cutter Grinder makes the important wartime job of tool conditioning simple, accurate, handy and fast.

Don't Neglect Your Toolroom It's the Backbone of Production!

Write for bulletin giving full details.

OLIVER INSTRUMENT COMPANY

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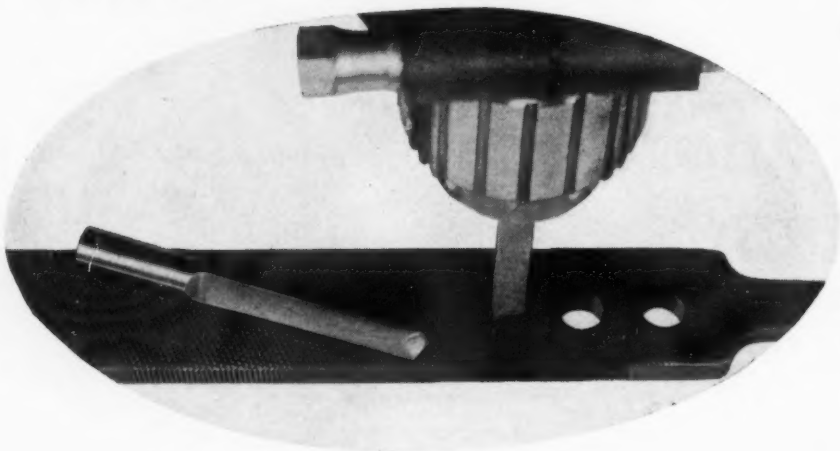
AUTOMATIC DRILL GRINDERS—TOOL AND CUTTER GRINDERS—DRILL POINT THINNERS—TEMPLATE TOOL GRINDERS—FACE MILL GRINDERS—DIEMAKING MACHINES

"HARDSTEEL"

WILL DRILL YOUR OWN SAMPLES



AT THE A. S. T. E. MEETING

Look for our working exhibit—watch us drill hardened steels and plastics—at the A.S.T.E. Meeting, Mechanics Hall, Milwaukee, March 25th to 27th.

Bring with you a sample of your own—any hardened steel or plastic part—and watch us drill it with a "HARDSTEEL" drill. If the piece is too big, bring a print and let's talk it over. We'll show you how to step up production, cut rejects, lower costs by the use of "HARDSTEEL."

Look for us in Spaces 107-8 and don't forget your sample.

BLACK DRILL COMPANY
5005 EUCLID AVENUE
CLEVELAND, OHIO

YOU HARDEN IT—WE'LL DRILL IT

"HARDSTEEL"
DRILLS · REAMERS · TOOL BITS · SPECIAL TOOLS

How to save time by doing more reading

That is a profitable paradox for you. More true today than perhaps ever before. For here in the pages of this publication are packed many helpful ideas . . . considerable useful information. Much of it, in fact, available from no other source.

And we most emphatically mean *both* the editorial and the advertising pages.

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★

Good advertising speeds information from those who have it . . . to those who need it.

★

McGraw-Hill Publishing Company, Inc.

330 West 42nd Street New York

A flexible machine that is the last word in simplicity of operation

HI-SPEED
HONING and LAPPING MACHINE

for use with any standard make honing head

Illustrated is No. 0 Machine equipped for 36" stroke with 80" under the spindle.

HONES CYLINDERS up to 24" in diameter . . . with STROKES from 20" to 72" . . .

IDEAL FOR PRODUCTION JOBS INVOLVING:

Aircraft parts . . . Ordnance parts . . . Diesel engines . . . Compressors . . . Pumps . . . Internal combustion engines . . . Steam cylinders, etc.

Speed up war work involving internal cylindrical surfaces by utilizing a HI-SPEED Honing Machine. When used with proper honing head of any standard make, the HI-SPEED machine produces accurate, straight, round, smooth bores—amazingly fast.

Unique positive stop and dwell system makes it possible to stop the spindle without shock or impact at the bottom of each stroke, at any point within the stroke range and hold the spindle without reciprocation, at that point up to 1½ minutes. Ideal for "blind hole" honing and straight line lapping or honing.

All controls are located at the front of the machine at the operator's station . . . No ladders to climb . . . Stroke setting, hone withdrawal, short stroking at any point, changes in speed of reciprocation or rotation of the spindle made instantly from operator's station.

The HI-SPEED Honing Machine is made in 4 sizes, any one of which can be had with strokes up to 72"... Designed for use with any standard make of honing head.

Tell us your requirements—and our engineers will promptly furnish you with complete information, prices and early delivery dates.

NOTE THESE SPECIFICATIONS:

Model No.	No. 0	No. 1	No. 2	No. 3
Stroke (standard)	20"	36"	48"	72"
Working Base Area (standard) . . Auxiliary Tables available	21" x 22"	31" x 31"	31" x 31"	48" x 54"
Height Under Spindle Nose (up) . . Added Height Available on Order.	48"	60"	75"	100"
Spindle Diameter	2⅜"	2⅜"	2½"	2¾"
Spindle Speeds Through Gear Box	4	4	4	8
Main Drive Motor (standard)	7½ hp	10 hp	15 hp	20 hp
Coolant Pump Volume, Motor Driven	14 gpm	18 gpm	18 gpm	25 gpm
Maximum Bore possible to hone with standard spindle drive motor . .	10" Dia.	12" Dia.	16" Dia.	20" Dia.
Maximum Overall Diameter of Cylinder possible to place on standard base	18"	27"	27"	44"
Floor Area	44"x60"	60"x80"	60"x80"	60"x108"
Overall Height	11'6"	15'3"	18'3"	23'8"

NOTE: Under our new policy of distribution, sales territories are being assigned to financially responsible, established dealers in the machine tool field. A few excellent territories are still open, and dealers are cordially invited to write us relative to sales representation.

AUTOMOTIVE MAINTENANCE MACHINERY CO.
2100 Commonwealth Avenue, North Chicago, Illinois

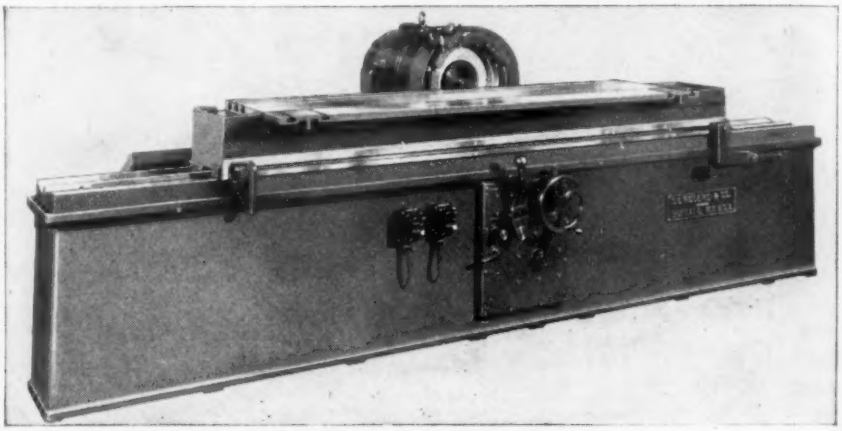
TYPE NT-20 ROGERS FACE GRINDER

ACCURATE · ECONOMICAL ROGERS KNIFE & SAW GRINDERS

Built by
SAMUEL C.
ROGERS
& COMPANY
197 Dutton Ave. Buffalo, N. Y.

Specially designed for .....STEADY, FAST PRODUCTION of LONG NARROW and LIGHT WORK

This new model traveling table face grinder, ruggedly built for relentless production, takes work 10" to 12" high. Table length is 72", width 16". A 10 H. P. motor mounts a 20" cylinder grinding wheel for medium duty service. Two-speed table traverse powered by 3 H. P. motor. ***Send for Circular NT-20***



CAPACITY 60-72" x 16" x 12"

PRECISION QUALITY ROGERS GRINDERS SINCE 1887

MODELS 10-14 FEATURE THE *NEW* PATENTED

NO SPRAY NO SPLASH WHEEL GUARDS

"You're Dry when you grind Wet"

Guards are concealed, easily accessible, maximum light and operation freedom around the wheels.

WRITE FOR BULLETIN 201

Other Hammond Grinders: "4" Combination Chipbreaker and Grinder; 6, 10A, and 20S Carbide Tool Grinders.

Hammond OF KALAMAZOO

CARBIDE TOOL GRINDERS

MODELS 4, 6, 10, 14, 20

Hammond Machinery Builders INC

★ ★ ★ 1618 DOUGLAS AVENUE ★ ★ ★

KALAMAZOO • MICHIGAN

EASTERN BRANCH 71 W. 23rd STREET, NEW YORK CITY

A Powerful Suction is Important

There is no chance for grinder dust to damage human lungs and work as an abrasive on expensive equipment when it is trapped the instant it leaves the wheel.

The powerful fan of the Air Master surely and quietly draws harmful grit of grinding and buffing wheels into filter bags - - keeps it out of the air. There's a size for every wheel. Easy to install, easy to clean.

Write today for descriptive literature.

The Cincinnati

ELECTRIC DRILLS • GRINDERS • BUFFERS • PORTABLE TOOLS

The Cincinnati Electrical Tool Co.

DIVISION OF THE R. K. LE BLOND MACHINE TOOL CO., CINCINNATI, OHIO

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The TESTMASTER

REG. U. S. PAT. OFF.

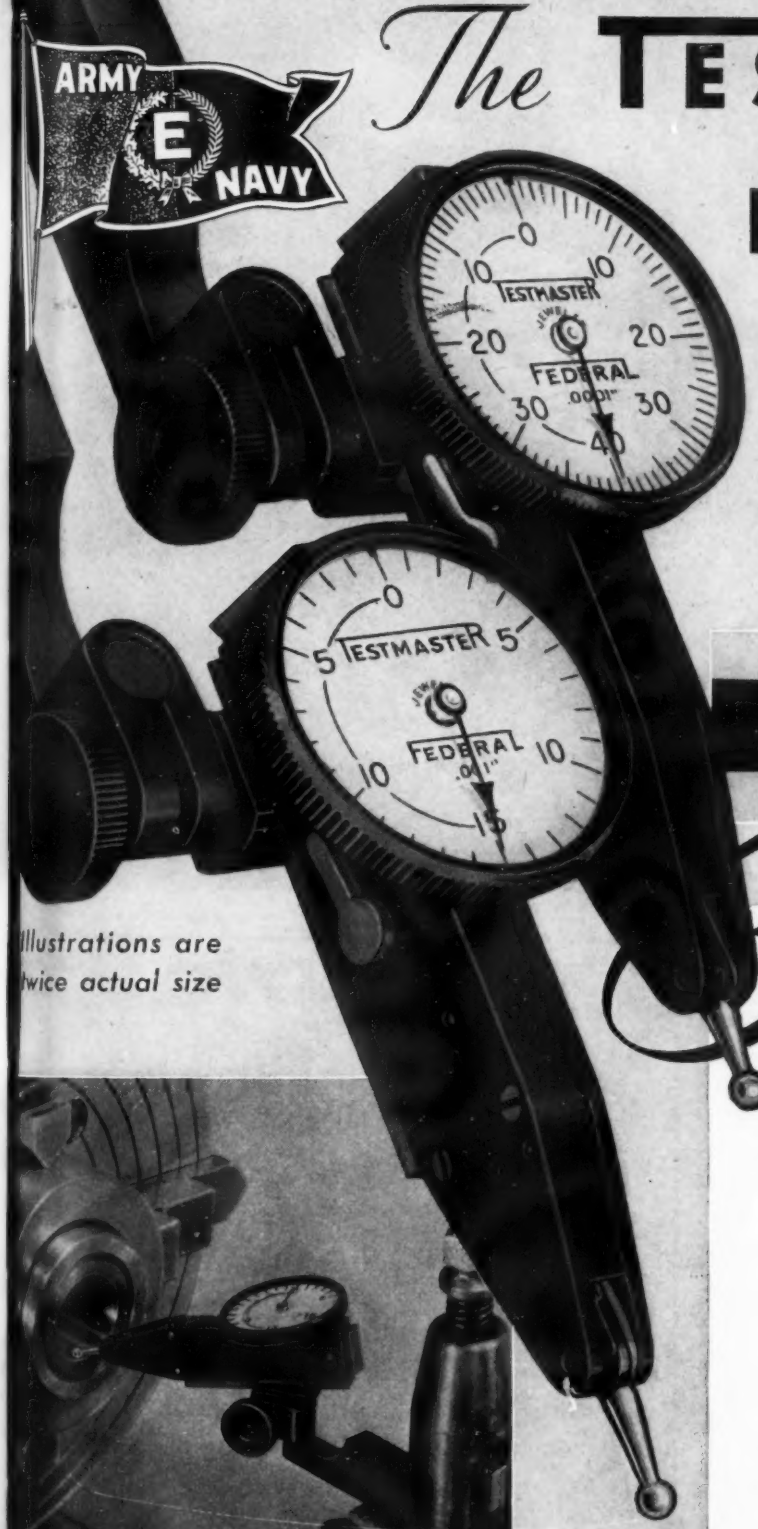
UNIVERSAL

DIAL INDICATOR

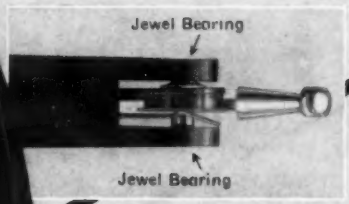
with the NEW

INDEX POINT

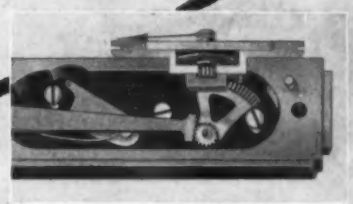
that locks in place and sets positively



Illustrations are twice actual size



Serrations mesh positively. Interchangeable point locks on pivot. Low friction bearings.



Crown gear reduces friction and inertia — greater accuracy.

For lining up and testing machine work the Testmaster is exceptional.

You get more quality features in this *new* FEDERAL Universal Test Indicator.

The Testmaster universal test Indicator is chock full of detail features that you will appreciate more and more as you use it.

First — It's accurate. Friction, inertia and wear have been reduced to the minimum.

Second — Its point swivels positively. It won't slip and it won't come out unless you want it to.

Third — The point can be set to work in either direction; up or down.

Fourth — The universal clamp enables setting in any position (other holding bars can be substituted).

Fifth — It has dovetail slides on the bottom edge and back end for more universal setting.

Sixth — Its quality is worth more than the price.

The Testmaster is not sold in stores. Addresses of our offices in the cities below are listed in local telephone books. Or, write us for circular.

FEDERAL PRODUCTS CORPORATION

1144 EDDY STREET PROVIDENCE, R. I.

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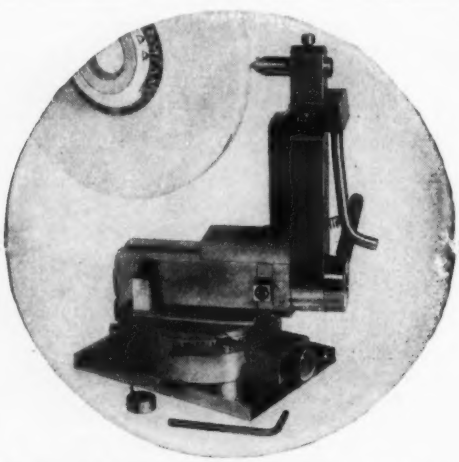
Model A Arter Rotary Surface Grinding Machines grinding cams for radial aircraft engines. This part, so highly essential to efficient operation in service, is ground to precise limits and fine finish. This is but one of many other precision jobs on which Arters are being successfully employed in the great American aircraft industry.

ARTER GRINDING MACHINE CO.
Worcester, Mass., U. S. A.



An instrument of precision and versatility . . . Operation is simple requiring no high degree of skill for accuracy . . . Any one of the following can be produced with one setting:

One angle
Two angles
Concave radii up to 6"
Convex radii up to 4½"
Two angles and radius.
Many other diversified forms to meet requirements.

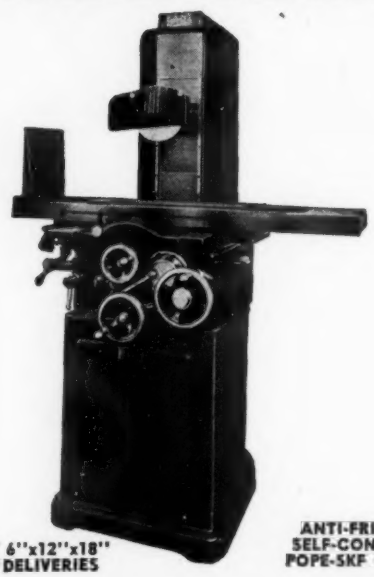
Wheel size capacity—9" dia; angular travel 3"; for use on universal surface and cylindrical grinders.

Full details available on request.

A RADII & ANGLE DRESSER
OF PRECISION AND VERSATILITY

MANUFACTURED BY
J. & S. TOOL CO. 477 MAIN ST., EAST ORANGE - N. J.

ATLANTIC
No. 2 Automatic Precision
SURFACE GRINDER



CAPACITY 6"x12"x18"
PROMPT DELIVERIES

ANTI-FRICTION
SELF-CONTAINED
POPE-SKF SPINDLE

ATLANTIC MACHINERY CORP.
149 Broadway New York, N. Y.

Flexible Shaft Machines will do it QUICKER...BETTER

AND HASKINS WILL DO IT LONGER

TYPE HS-7 1 H.P. heavy duty unit with multi-speed countershaft drive.

THERE'S NO END of jobs for Haskins Flexible Shaft Equipment around a machine shop, foundry or die shop. Haskins makes 30 different units—each engineered for a single type of work, but capable of doing *many* kinds of jobs. So broaden your use of Haskins Flexible Shaft Machines. You can't get them down. You *can* get lower costs per man and machine hour. Catalog 45 shows many ways to speed production with flexible shaft equipment. Write for a copy. R. G. Haskins Company, 2760 W. Flournoy Street, Chicago.

BIG FELLOWS OR LITTLE FELLOWS—Haskins has what it takes to do the job—and to *keep on* doing it. The right mounting. The right power. The right drive—direct or multi-speed countershaft—for sanding, polishing, heavy duty grinding, rotary filing and wire brushing.

HASKINS

HASKINS *Flexible Shaft* EQUIPMENT

More VERSATILE Machines for More PROFITABLE Work

SOSSNER STEEL STAMPS

. . . 32-years of precision stamp cutting. Sossner assures immediate attention and PROMPT DELIVERIES.

STEEL STAMPS
SOSSNER
SOSSNER
STEEL STAMPS

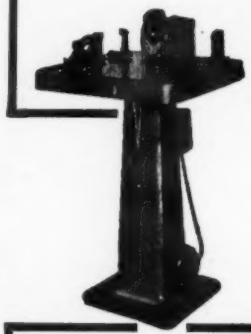
TAPS
GAGES
CUTTING TOOLS

161 Grand St., New York City, or 27 B'way, Lynbrook, N. Y.

FLATNESS and SMOOTHNESS of Production Parts

The Ultra-Lap machine will finish your parts to a flatness of one light band or less . . . to a smoothness as low as one micro-inch R.M.S., any metal or material. Much faster, more uniform than hand method. Machine designed for you or we shall be pleased to lap your parts on a job basis. Ultra-Lap machines and service used by aircraft and many other war-time industries.

Ultra-Lap MACHINE COMPANY
207 McDOUGALL AVE. · DETROIT, MICH.



FASTER, MORE ACCURATE CUTTER GRINDING ASSURED with the "BARNES"

The Barnes Precision Cutter Grinder will grind formed cutters faster and preserve form absolutely. Cutter life is extended five to eight times over ordinary methods.

Utility and speed of the "Barnes" extends to the grinding of all types of cutters regardless of profile without changing existing cutter equipment. Form relieved cutters, sharpened on this machine become profile cutters. No high degree of skill is required to grind even the most complicated or irregular formed cutter.

Send for Descriptive Circular

GENERAL MACHINERY CORP.
140 Federal St. Boston, Mass.

ACROMARK

numbering, stamping and marking machines and accessories are extensively used where fast, accurate permanent work is a prerequisite.

THE ACROMARK CO. ELIZABETH NEW JERSEY

PRODUCTION GOES UP . . . COSTS COME DOWN

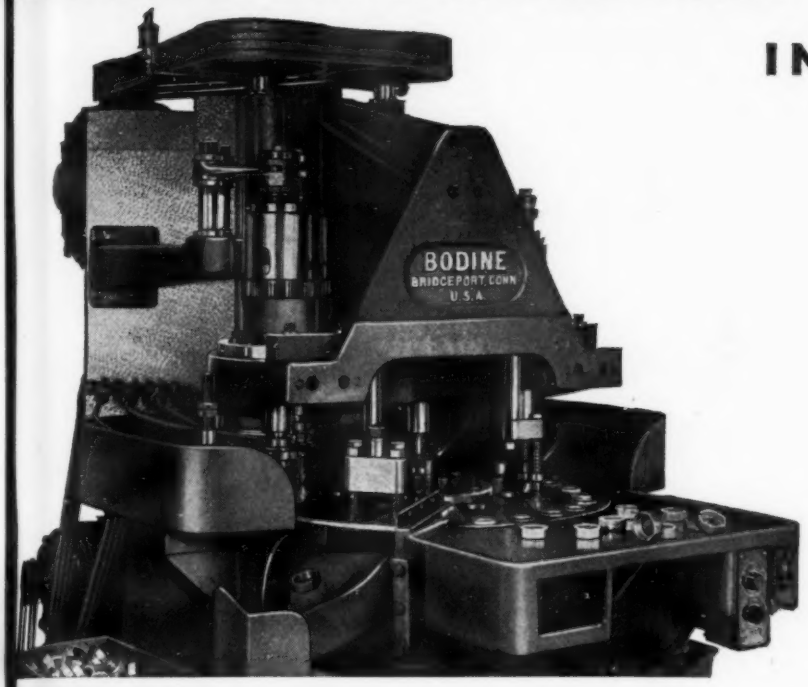
THIS improved grinder speeds production in war plants throughout the country. Simplex-M eliminates costly hand emerying and filing. Assures straight grain, sharp edged finish. Variety of sizes and styles.

Informative Booklet on Finishing Free

WALLS SALES CORP., 96 Warren St., N. Y. C.

SIMPLEX-M ABRASIVE BAND GRINDER

Bodine SMOOTHES OUT THE WRINKLES IN *Small Parts* PRODUCTION



In high speed production of small parts which may require several operations on each one, it's the little mechanical "wrinkles" that cause deep furrows in the production man's brow.

The careful engineering of Bodine machines eliminates those mechanical wrinkles that can cause spoilage, machine and tool damage, and consequently expensive down time.

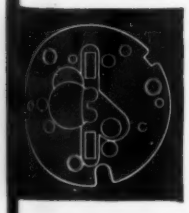
The five small parts illustrated below are processed on Bodine machines (there are six sizes) at high speeds and with extreme accuracy . . . and, most important, by easily set up and operated machines that do not require highly skilled operators.

TYPICAL OPERATIONS FOR #40-10

Tooled for processing contact blades for attachment plug caps. Operations: tapping 6-32 hole, inserting binding screw (automatically hopper fed to screw driving spindle), spinning (or staking) screw on end, backing up screw, inspect and eject. Hi-production, accurate finish.

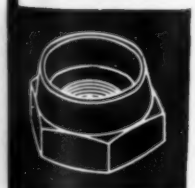
TYPICAL OPERATIONS FOR #41-20

Drilling and Tapping set-up for processing a "jewel plate". Operations: reamed for .156 hole, 2 holes countersunk, 2 holes tapped 2-56 T.P.I., .111 dia. hole countersunk from bottom. Six operations on each piece at one handling. Hand loaded on dial — automatic ejection.



TYPICAL OPERATIONS FOR #42-30

This special (Bodine patented) set-up is for rapid production of accurately located holes in a delicate ordnance component. Operations: seven holes drilled (sizes .5mm to 2.8mm dia.) with tolerance for center distance .0004". By changing dials and relocating spindles many different set-ups can be made on a single machine.



TYPICAL OPERATIONS FOR #48-20

Here is a dial and tooling arrangement for producing a special type nut. Blanks are hand loaded to dial. First spindle drills for equivalent of a counterbore diameter. Second spindle drills the tap hole thru the blank, and next spindle taps the hole to class 3 fit, square with face of blank. Two completed nuts to each stroke of machine. Speed depends upon size of nut and material.

TYPICAL OPERATIONS FOR #48-30

To drill and thread this ¾" malleable iron pipe union nut, heavy duty drilling and threading spindles (2 of each) are provided. The collapsible taps produce the thread in minimum time. Operations: Ream 2 diameters and seat, tap 1 9/16"-12 T.P.I. Even semi-skilled operators obtain maximum production.

DRILLING, MILLING, TAPPING, SCREW INSERTING *Simultaneously*

Multiple spindles (6 to 8), holding tools up to ½" dia. and with vertical stroke to 3½" depth, operate on work indexed to located positions by the automatic horizontal dial. Tools may be set for vertical, horizontal or inverted operation or all three at once . . . for drilling, milling or tapping, and, in some cases, for screw inserting. Tools, machine and operators are protected by electrical interlocks.

Another advantage is the small floor area required — 54"x60" for the #40-10 machine; 90"x96" for the #48-30.

THE **Bodine** CORPORATION
BRIDGEPORT CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

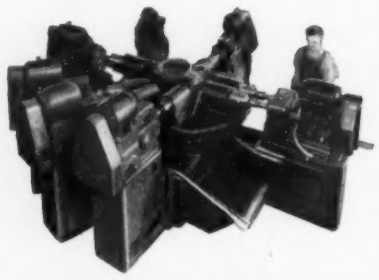
Here's how to get and maintain the production you need . . .

WITH LESS EQUIPMENT

STANDARD HYDRAULIC UNIT — USED IN VARIOUS MACHINE COMBINATIONS AS SHOWN BELOW.

STANDARD AUTOMATIC UNITS *plus* SPECIAL TOOLING OFFERS BETTER SOLUTIONS TO DRILLING, BORING, MILLING PROBLEMS

It is not uncommon to find an installation of but a few special machine tools wiping out the need for batteries of standard machines doing the same operations. There are two basic reasons for this. Often times standard machines are purchased in quantity before giving sufficient thought to the proper method of processing the work. In other cases, the periodic need for increased production has resulted in the addition of duplicate equipment, resulting in too many machines doing the same job.



A TYPICAL INSTALLATION

This precision boring machine bores 9 holes simultaneously in aluminum-alloy accessory housing.

PRODUCTION INCREASED 6 TIMES

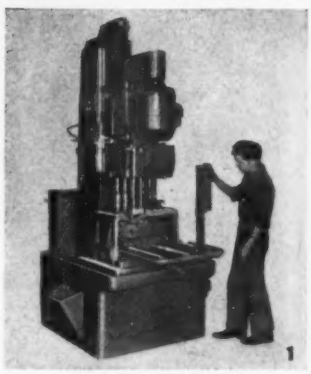
Machining time was cut from 30 to 5 minutes, floor-to-floor, with complete and assured uniformity.

DIAMETER HELD TO ± .0005" — LOCATION — ± .0001" ANGULAR LOCATION ± 15 SECONDS.
Elimination of individual settings and numerous gaugings made it possible to consistently maintain these close tolerances.

Whatever the cause, Unit-Type machine tools make practical solutions to most of these production problems. However, before designing a new machine to accommodate multiple operations, it is necessary to make a preliminary study in order to determine your most productive machining sequence.

EXPERIENCED ENGINEERS AVAILABLE TO ASSIST IN TOOLING

Our engineers will be glad to make an analysis of your present machining sequence with a view towards increasing your production with special machine tools. Wherever possible they will recommend our unit-type machines. These are made from standard hydraulic self-contained power units arranged to suit the most practical tooling of your work. Being standard, you save engineering and pattern costs for complete feed and drive units. Send in your part prints and production requirements for an estimate . . . there is no obligation.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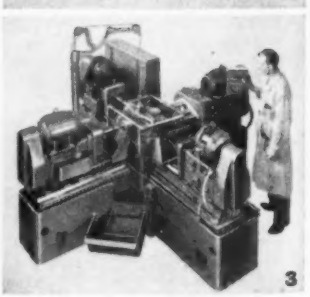
2


3

1. Six spindle vertical machine for drilling and counterboring airplane engine crankcase. **2.** Six unit machine with index table for multiple operations on airplane engine part. **3.** Four way machine for various drilling operations on airplane engine crankcase.

Free! **PRODUCTION AND TOOLING IDEAS**

Get these 8 bulletins today. Each traces a machining problem from the original production requirements to the final machine design. Each may suggest a tooling or production set-up that you can use today — valuable file information for tomorrow. Ask for bulletins M30 through M38.

W.F.& JOHN BARNES

W. F. and JOHN BARNES

310 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.

SAVE TIME • SPEED PRODUCTION with CLAYTON *Boring Bar Holders —and Boring Bars*

EXCLUSIVE CLAYTON FEATURES

1. Tool bits can be raised or lowered by releasing one nut, which DOES NOT disturb alignment of bar with lathe.
2. "Stickout" length can also be altered without changing alignment.
3. Complete bar and holder can be removed from lathe compound and replaced without loosing tool bit setting.
4. Solid one-piece steel bar of full diameter contributes to extreme rigidity and strength, and eliminates chatter.
5. No file or chalk marks required when boring blind holes, because of ¼" graduations etched into bars.

Clayton Boring Bar Holders are a real improvement over conventional holders. They employ an entirely new and better clamping arrangement—are more rigid—and permit deeper cuts. By reducing set-up time they quickly repay original investment. Due to their many exclusive advantages, CLAYTON HOLDERS have replaced other Bar Holders in hundreds of plants. It will pay YOU to investigate Clayton Boring Bar Holders regardless of the Holder you are now using.

Order from your local supplier or direct from us. Prompt delivery assured. Write for literature and prices.

ARMY E NAVY

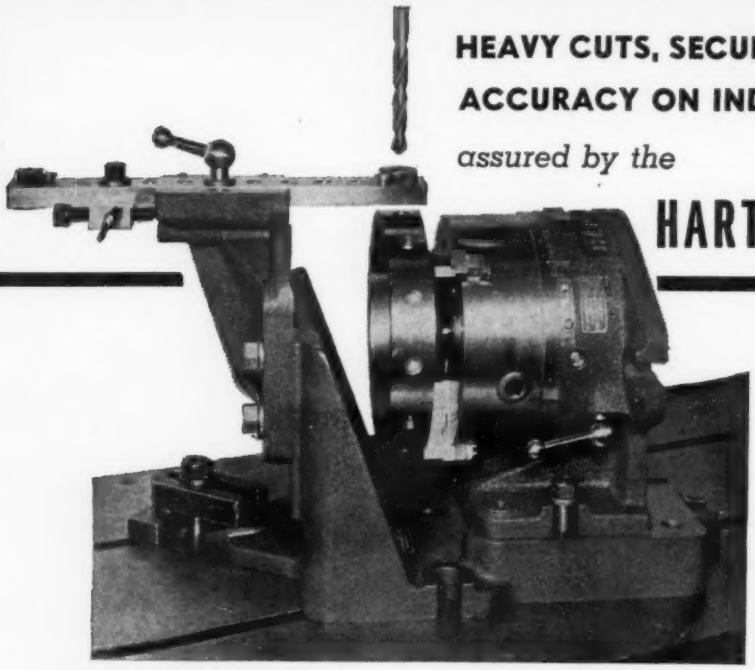
CLAYTON *Manufacturing Company*

ALHAMBRA, CALIFORNIA • DEPT. M.

HEAVY CUTS, SECURE HOLDING and ACCURACY ON INDEXING OPERATIONS

assured by the

HARTFORD SUPER-SPACER



Better, faster and more accurate work is being performed in shops and tool rooms through the use of this modern, sturdy indexing device. Applicable to millers, drilling machines, slotters, grinders and jig borers, it provides a tried and proven means to speed set up. In view of the fact that it can be used in either a horizontal or vertical position, its range of utility is remarkably broad. Rapid, accurate indexing is assured by mask plates which eliminate all chance of error.

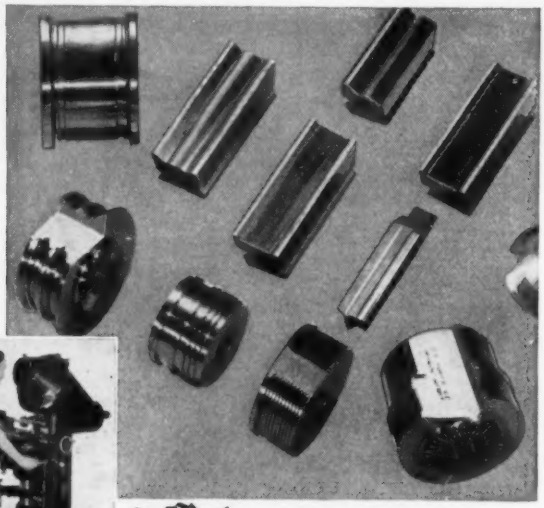
RADIAL DRILLING CAN ALSO BE SPEEDED UP

Through the use of the HARTFORD RADIAL DRILL ATTACHMENT, easily secured to the base of the SUPER-SPACER, radial drilling indexing operations can be conveniently handled. Provision is made for taking care of lengths and diameters in radial drilling. Set-up time is practically negligible.

Investigate!

THE HARTFORD SPECIAL MACHINERY COMPANY

HARTFORD CONNECTICUT



Midwest Tools are inspected under the comparator—a highly sensitive shadowgraph device where a variation of .001" can be detected with the naked eye.

MIDWEST **FORM TOOLS**

These Midwest Tools in various forms: Circular, Flat and Dovetail, guarantee extreme accuracy in screw machine production work . . .

Send in parts prints, specify material to be cut, machine to be used. Ask for Bulletin 16D.

MIDWEST TOOL & MFG. CO.
2356 W. Jefferson Ave., Detroit, Mich.

MIDWEST
manufacturers of
PRECISION METAL CUTTING TOOLS
for more than 30 years

Milling Cutters • Sleeves
Counter Bores • End Mills
Reamers • Special Tools
Form Tools • Adjustable Holders • Carbide Tipped Tools

★ HOBS ★ REAMERS ★ COUNTERBORES
★ GEAR SHAPER CUTTERS ★ BROACHES ★ CIRCULAR AND FLAT FORM TOOLS
★ SLITTING SAWS ★ GEAR CUTTERS
★ SPECIAL TOOLS ★ MILLING CUTTERS

NATIONAL Tools CLEVELAND

Three Big Words

National . . . serving manufacturers throughout the nation

Cleveland . . where iron meets coal to make steel products

Tools . . . . implements speeding up Victory and Progress

NATIONAL TOOLS HAVE AN INTERNATIONAL REPUTATION

The NATIONAL TOOL Co.
11200 MADISON AVENUE CLEVELAND, OHIO

GREEN HANDS make fast work with Apex Safety Friction Tapping Chucks

INEXPERIENCED machine tool operators get the extra help they need with Apex Safety Friction Tapping Chucks. In the first place the hazard of overloading and breaking tools is practically eliminated. Taps work safely, accurately, at top speeds on thru or bottom holes.

Adjustment of the chuck for different size of taps is simple, and is maintained over long periods. End thrust set up by tapping or pressure exerted by operator on spindle will not affect friction setting. Multiple friction discs have large area and long service life.

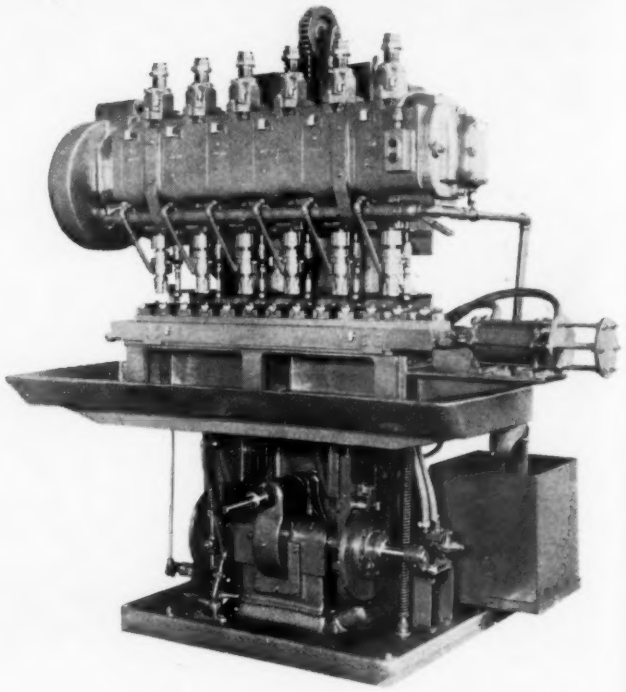
Use these chucks on drill presses, radials, hand screws, etc., and conserve cutting tools. . . . Catalog No. 14 sent on request.

APEX

THE APEX MACHINE & TOOL CO., DAYTON, OHIO

Manufacturers of Safety Friction Tapping Chucks, Quick Change and Positive Drive Drill Chucks, Vertical Float Tapping Chucks, Parallel Floating Tool Holders, Power Bits for Phillips, Slotted Head and Clutch Head Screws, Hand Drivers for Phillips and Clutch Head Screws, Aircraft Universal Joints, Plain Universal Joint Socket Wrenches.

Specialization *HELPS* Production



U. S. industrial production has thrown consternation into the enemy camp because machine design engineers, tool engineers, shopmen and management have used and are using their combined ingenuity and manual skill to create machines and methods which outstrip the best efforts of the opposition.

One example of American productive genius is the Moline No. 16D special machine which taps a certain small steel part. This machine, like many other Moline products, was designed to do one particular job and do it well in a minimum time.

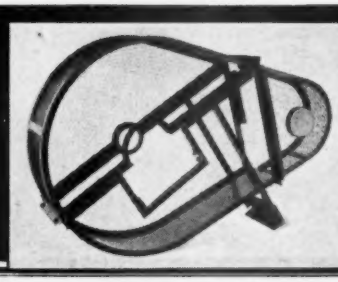
DRILLING • BORING • HONING • TAPPING • SPECIAL MACHINERY

MOLINE TOOL COMPANY MOLINE, ILLINOIS
"HOLE HOG" ESTABLISHED 1901

LITTLEFORD
GEAR GUARDS

If you have gears, chain drives, etc., exposed, cover them with a Littleford Gear Guard; cut down accidents and lost man hours by playing safe. Send blueprints today for prices and delivery date.

LITTLEFORD BROS., INC.
434 E. Pearl St. Cincinnati, Ohio



LATHE PANS
SPLASH GUARDS · MACHINE BASES

LITTLEFORD

For Employee Training

"THE TOOLS OF OUR TRADE" . . . *American Machinist's* 16-page special section on elementary shop practice now available in reprint form.

AMERICAN MACHINIST—330 W. 42 St., New York, N. Y.

Please send me.....copies of "The Tools of Our Trade"

Name .....

Title .....

Firm .....

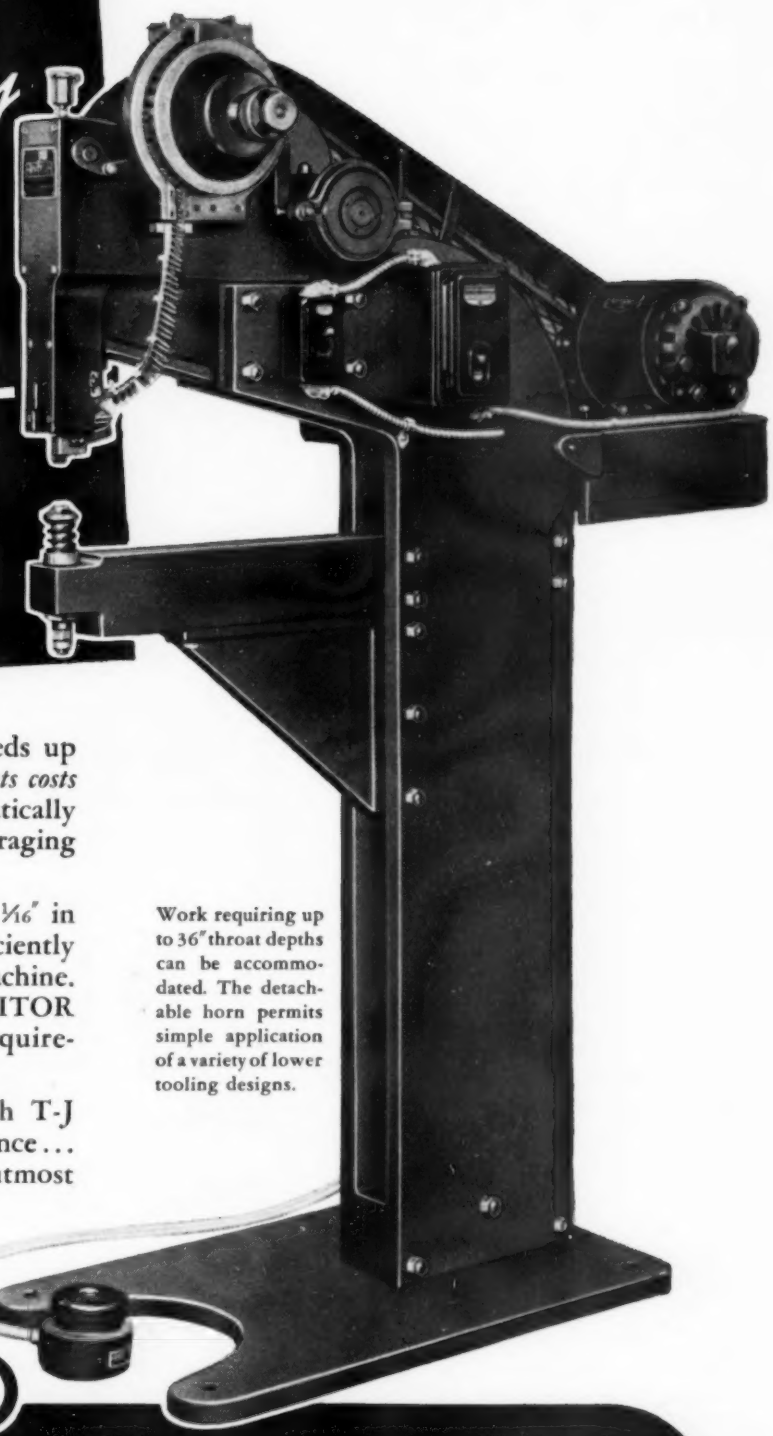
Address .....

Production executives will find in this exactly the type of information needed by new workers. Removes the chief obstacle to the novice's progress—the simple fact that he doesn't know the names of things. Covers measuring, gaging, marking, holding, cutting, forming and milling tools. Basic instruction data which will save you months of preparation time.

10c each—MAIL COUPON TODAY

1600 PER HOUR

Automatically
FEEDS AND SETS
$\frac{1}{4}$" DIAMETER
SOLID STEEL
RIVETS



THIS versatile "RS" RIVITOR speeds up riveting...does a better job...and *cuts costs* for many industries today! It automatically feeds and sets rivets at rates averaging 1600 per hour!

Solid rivets ranging from ¼" to 1/16" in diameter are handled rapidly and efficiently (with different tooling) by this machine. Thus, the Tomkins-Johnson RIVITOR offers greater capacity...meets requirements of a greater number of jobs.

Ruggedly built...designed with T-J know-how based on long experience... this RIVITOR meets demands for utmost dependability and long life. Write today for bulletin R-4. The Tomkins-Johnson Co., Jackson, Michigan.

Work requiring up to 36" throat depths can be accommodated. The detachable horn permits simple application of a variety of lower tooling designs.

FOR TOUGH JOBS...SPECIFY T-J

TOMKINS-JOHNSON
RIVITORS

THIS COMBINATION
WILL GIVE YOU
HIGHEST TAPPING PRODUCTION

Ettco-Emrick

TAPPING MACHINE
MULTIPLE TAPPING HEADS
ADVISORY SERVICE

All of the factors which determine high tapping production are provided in this Ettco-Emrick combination.

1. THE TAPPING MACHINE provides the means by which even unskilled operators—male or female—can do fast, accurate tapping because the skill usually required is *built into the machine.* All the operator has to do is feed the work and step on the foot pedal.

2. THE MULTIPLE HEADS provide the means for tapping the maximum number of holes simultaneously.

3. THE ADVISORY SERVICE which goes with every Machine and every Head, consists of recommendations on the best method of handling specific parts including work holder designs, and on the right taps for the job. Users have often told us these recommendations, based on 25 years of specialization in machine tapping, are alone worth the price of the equipment.

THESE BULLETINS GIVE THE DETAILS

BULLETIN No. 4
covers the Tapping Machine.

BULLETIN No. 3
covers the Multiple Heads.

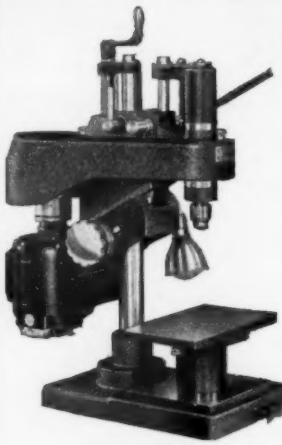
Copies mailed on request. Write for them.

A 2-spindle Head is standard equipment on the Tapping Machine.

ETTCO TOOL CO.

590 Johnson Ave., Brooklyn, N. Y.
Detroit • Chicago

The Famous Ettco-Emrick **DRILL CHUCKS • TAP HOLDING CHUCKS**
TAPPING ATTACHMENTS • TAPPING MACHINES
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS
Unexcelled for Design, Materials and Workmanship



FOR GREATER SPEED RANGE, SENSITIVITY AND EASE OF OPERATION . . .

HAMILTON
"VARIMATIC"

. . . SUPER SENSITIVE, VARIABLE SPEED DRILLING MACHINES!

★

LOW RANGE
Min. Spindle Speed 840 — Max. Spindle Speed 2700

HIGH RANGE
2900 — 9300

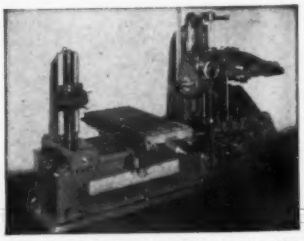
DRILL CAPACITY
.004" to 5/16"

Here's a unit built with "instrument precision", fully capable of handling the finest work for both defense and peacetime production. Combining sensitivity and ease of operation, the "VARIMATIC" allows instantaneous, variable speed adjustment in two ranges. (Speed changes are accomplished by means of a hand wheel. A graduated dial on hand wheel shows the speed at which the spindle is operating.) A letter will bring complete details—write!

The Hamilton Tool Co.
830 NINTH ST — HAMILTON, OHIO

UNIVERSAL *Horizontal Boring Machine*
The only **TRIWAY** *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

Production Goes *UP* . . .
Production Costs Go *DOWN* . . . with
NICHOLSON *Expanding* MANDRELS

Time-saving economy tools for holding work while being machined between centers on lathes, grinders, millers, shapers, etc. Made of hardened tool steel, precision ground.

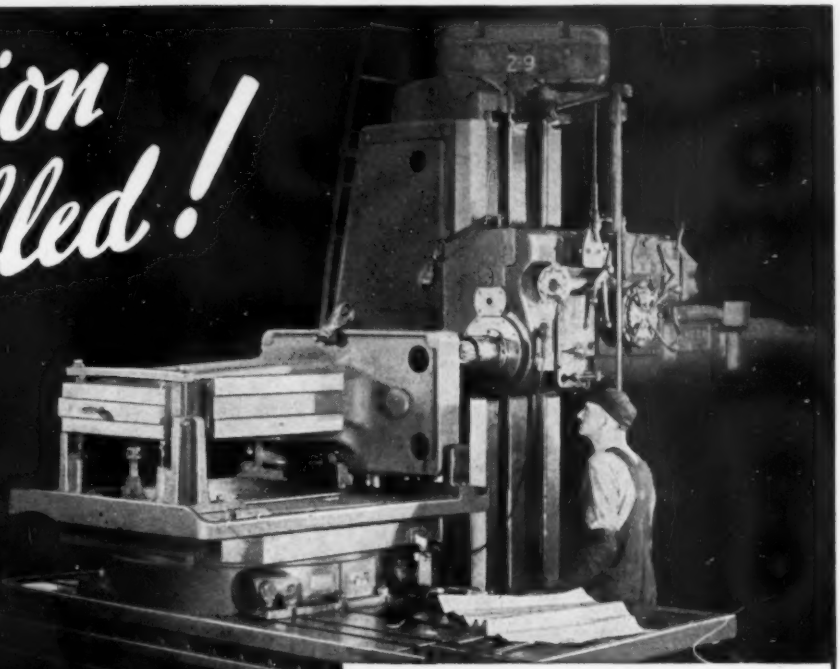
Sold singly or in sets.

Prompt delivery. Bulletin No. 741

W. H. NICHOLSON & CO.
114 OREGON ST., WILKES-BARRE, PA.
Other Products: Arbor Presses—Control Valves—Steam Traps—Floats
Flexible Couplings—Compression Shaft Couplings

Production Doubled!

15-HOUR JOB REDUCED TO 7½ HOURS

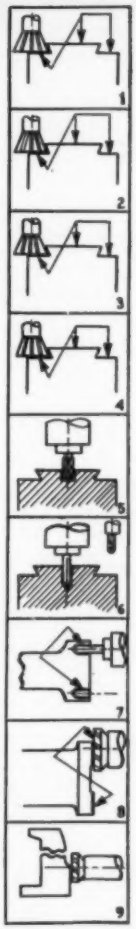


9 Operations Performed Include Rough and Finish Milling, Drilling and Tapping

It formerly took 15 hours to machine this machine-tool column. With this Giddings & Lewis Table Type Boring, Drilling and Milling Machine, the machining time has been reduced to 7½ hours.

In addition to increasing production and speeding delivery, accuracy has been improved. The columns were formerly machined on a traveling column machine with a fixed table. Both rough and finish milling cuts were completed on one side before resetting the column, thereby setting up strains and disturbing accuracy by not allowing the casting to cool.

This new G&L with the G&L rotary indexing table makes it possible to machine the entire casting in one setting. Operations can be performed in sequence best suited to obtain accuracy and production.



Versatility ...FOR PROPER MACHINING SEQUENCE

The proper sequence of operations performed on the column are shown below. Feeds and speeds used: Nine spindle speeds, from 23 to 183 r.p.m., nine table feeds from 1.9" to 16" per minute—one spindle feed, .019" per minute for drilling and tapping.

OPERATION 1—Rough dovetail way on top of column—7½" wide x 25" long. Index 90° for milling side.

OPERATION 2—Rough dovetail way on side of column—29" long. Index 90° for milling top.

OPERATION 3—Finish dovetail way on top of column—29" long. Index 90° for milling side.

OPERATION 4—Finish dovetail way on side of column—29" long. Index 90° for milling top.

OPERATION 5—Mill gear rack slot on top—15¼" long x .496" ± .001" deep.

OPERATION 6—Drill and tap eye bolt hole—49/64" drill, ⅞"—9NC Tap. Index 180° to drill bottom.

OPERATION 7—Drill 4 holes in bottom for hold down.

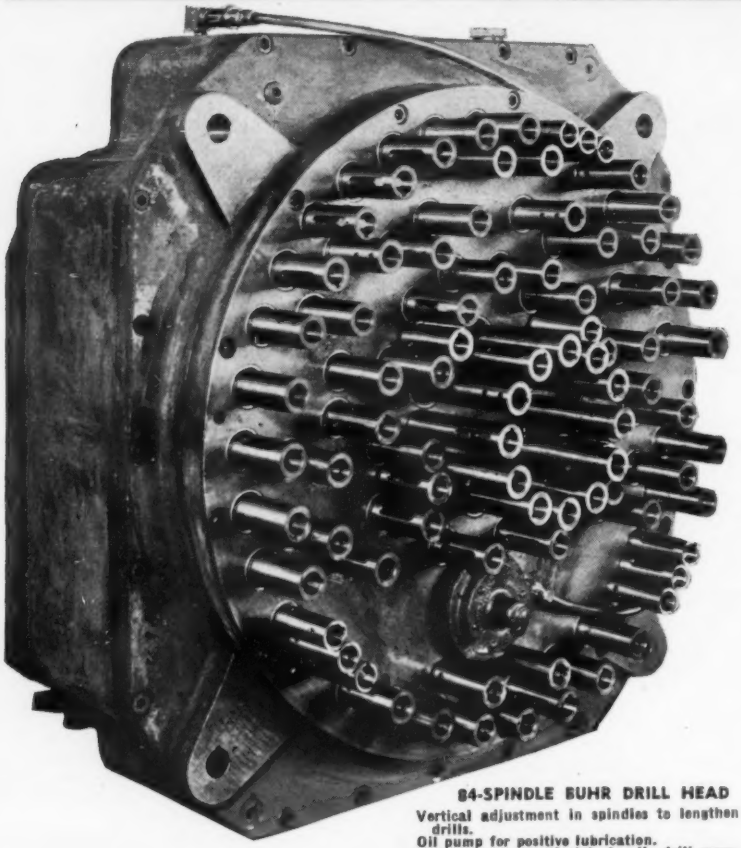
OPERATION 8—Mill pads on base. Index 90° for milling back side.

OPERATION 9—Mill surface for pump and coolant tank door.

GIDDINGS & LEWIS MACHINE TOOL CO.

138 DOTY ST., FOND DU LAC, WISCONSIN

Free Data — *Information covering the complete line of G & L machines and time-saving attachments and accessories is included in this catalog. Write for your copy. Ask for Catalog No. 32.*



84-SPINDLE BUHR DRILL HEAD
Vertical adjustment in spindles to lengthen drills.
Oil pump for positive lubrication.
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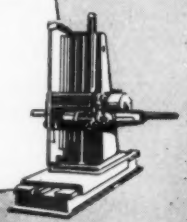

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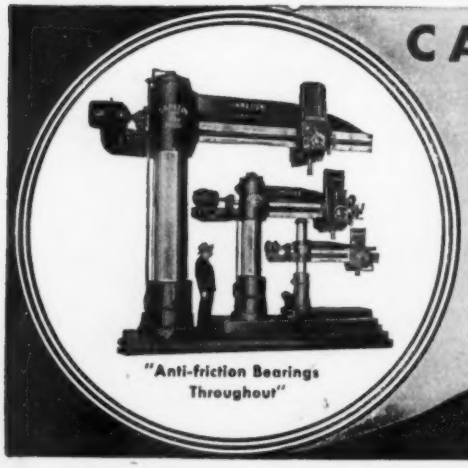

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ARMY E NAVY

A SNYDER Single-Spindle Machine for boring, facing and undercutting Aircraft Parts

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1 Quickly locates and equalizes parts of varying length in a special equalizing fixture

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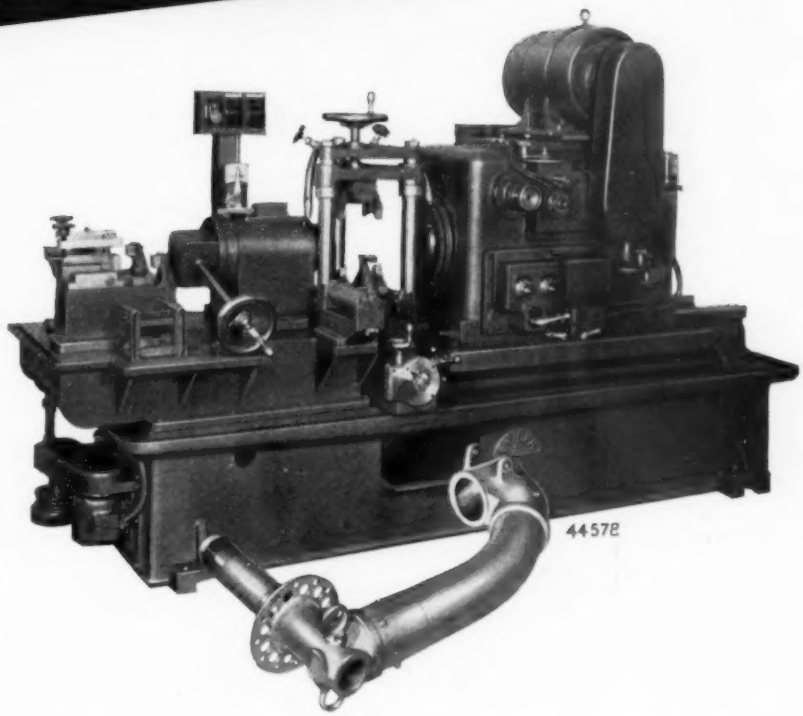
2 Performs a series of rough and finish operations by permitting rapid exchange of tools at the end of each work cycle



This single-spindle hydraulic boring and facing machine, designed and built by Snyder, is used to bore and face a cylinder adaptor hole in an aircraft part (illustrated at base of machine). The machine is equipped with a unit having a heavy-duty worm wheel driven spindle which can be operated at eight different speeds.

Tooling consists of a breech lock spindle adaptor and various boring, facing and undercutting tools. The distances which the various tools feed through the work piece are controlled by a revolving control dog rail, which is quickly set up for each individual tool. The operator readily exchanges tools when the spindle unit is in return position at the end of each work cycle.

The part is easily located and clamped against two ground diameters on a shaft exactly at right angles to the boss that is to be bored.

As the welded parts have a tendency to vary slightly in length, a part length indicator (shown beneath the electric push buttons) detects the length variation, which is compensated for by setting the second indicator (shown above the chip chute at the front of the fixture) at a reading corresponding to that of the part length indicator. Final clamping of the hub is done through equalizing Vee jaws.

Because rate of output, accuracy and safety are built into this machine, unskilled help can learn to operate it in a relatively short time.

Such is a typical example of Snyder engineering service. If you have a production problem, perhaps Snyder engineers can help you, too.

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speed equipment to all fronts of the

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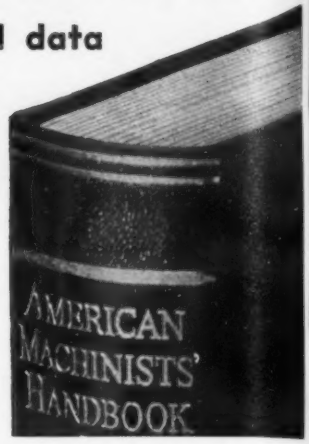

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Milling Machine Feeds and Speeds
Grinding, Honing and Lapping
Screw Machine Tools, Speeds
Punch Press Tools
Broaches and Broaching
Bolts, Nuts and Screws
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—with every pass!

The extreme accuracy of the Bakewell Precision Tapping Machine promises Class 3 or 4 gage fit threads with every pass of the tap—in any material from plastics to hard steels.

It's the exactness that has made the Bakewell indispensable to hundreds of war production concerns throughout the United Nations, cutting threads to strict Army-Navy specifications on a volume production never before possible.

SAVES CRITICAL MATERIAL

As the tapping operation is one of the last to be performed, such accuracy not only adds countless hours to the production schedule, but it saves thousands of dollars worth of critical material by eliminating costly rejects.

The patented combination of the Bakewell lead screw and solenoid actuated guide finger feed eliminates all possibilities of lead error. It does away with the backlash and compensates for the wear of the lead screw against the "nut." The tap acts only as a cutting tool.

SAVES HARD-TO-GET TAPS

And, in addition, there are many other features that should make your Bakewell pay for itself within 30 to 60 days after installation... The quick-to-operate positive limit switch that controls the thread depth to within 1/10th of a revolution; the double speed reversal that is still another time saver; the sensitive yieldable clutch that makes taps last three times as long.

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Now 4 models . . . No. 0—#0-80 to 8/32; No. 1—#4-40 to 5/8; No. 2—3/8 to 1½; No. 1 Radial.

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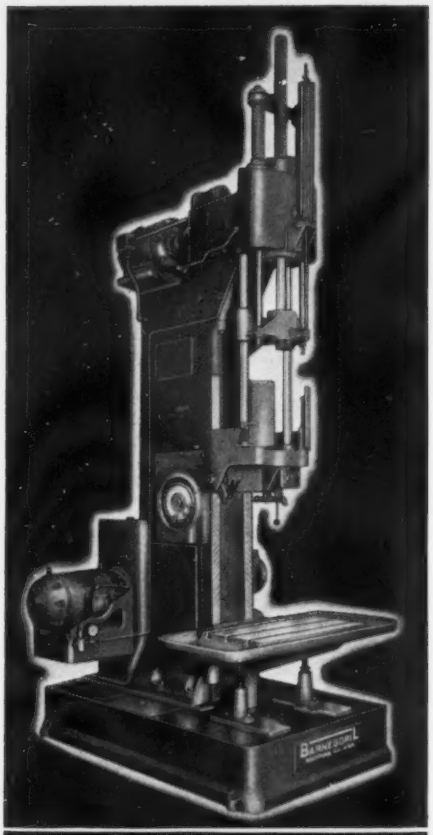
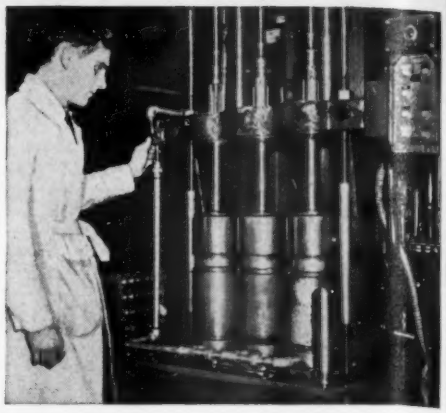


BARNESDRIL No. 307 Standard Honing Machine . . . adaptable to many jobs.

HOW *one* BARNESDRIL HONING MACHINE CAN FIT *three* DIFFERENT HONING NEEDS . . .

If you have any one of these three honing problems, the BARNESDRIL No. 307 Honing Machine can be tooled to fit your needs. Here is a machine with a standard basic design that permits a wide variety of tooling set-ups to fit different individual requirements.

FREE HONING DATA: Write for free copy of Bulletin No. A-148 containing facts on honing process and BARNESDRIL Honing Machines.



BARNESDRIL *Honer equipped with 3-spindle auxiliary head, honing three hydraulic landing gear cylinders*

(1) FOR HONING ONE BORE AT A TIME
This No. 307 Honing Machine can be used as a single-spindle machine with stationary fixture for honing one cylinder at a time.

(2) FOR MEDIUM PRODUCTION
If your production requirements are moderate, the machine can be provided with an indexing fixture using one or more stations, which permits loading while machining.

(3) FOR HONING MORE THAN ONE BORE AT A TIME
Where high production is required, this machine can be equipped with multi-spindles for honing two or more bores simultaneously.

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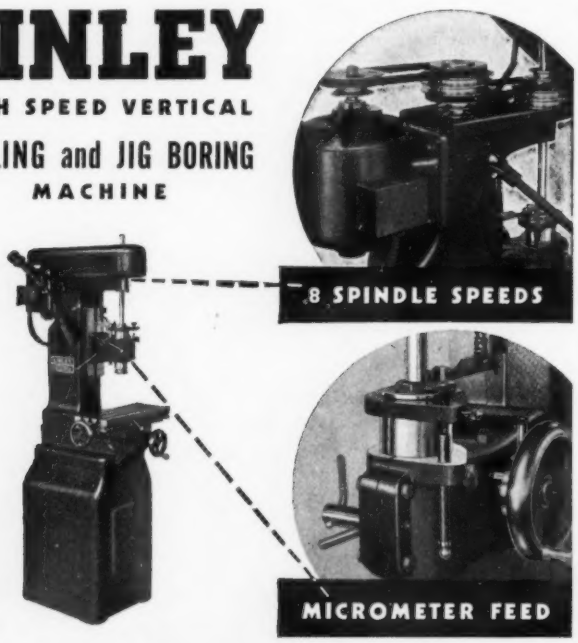

HIGHER SPEEDS on SMALL JOBS

The Linley provides new opportunities for speeding die work, jig making, metal pattern and model making, drilling, reaming, and milling. Eight spindle speeds instantly available. Simple, direct micrometer setting for fast, error-proof set-up. A precision machine that frees larger machines for heavier work. Write today for 4-page descriptive bulletin.

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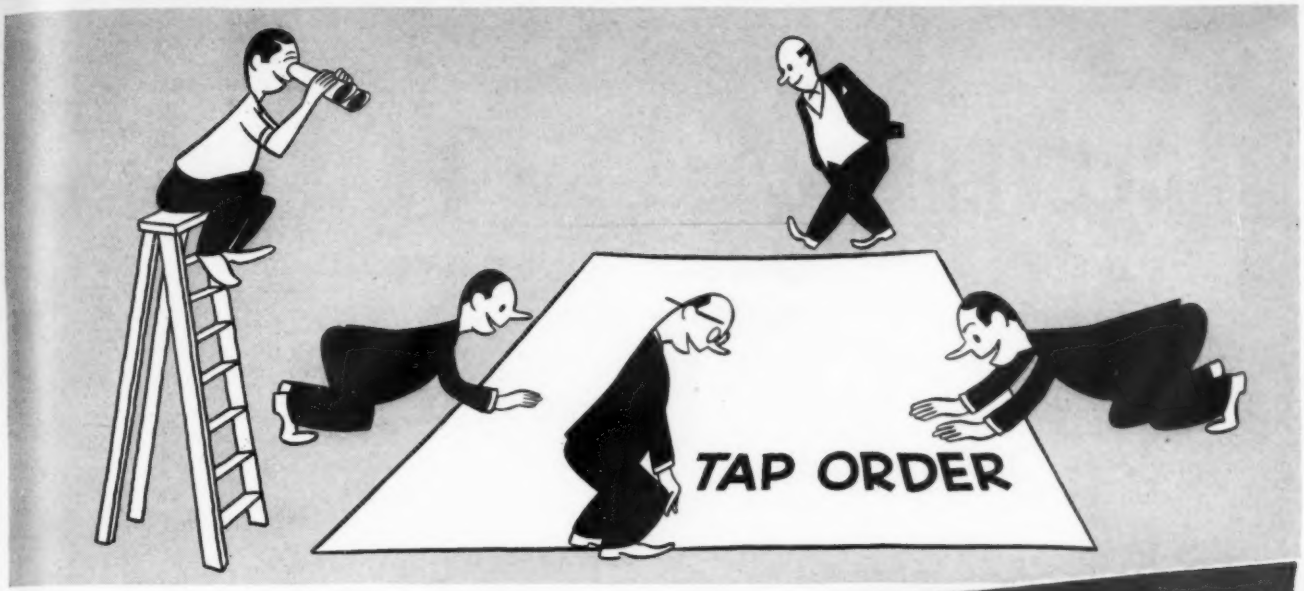

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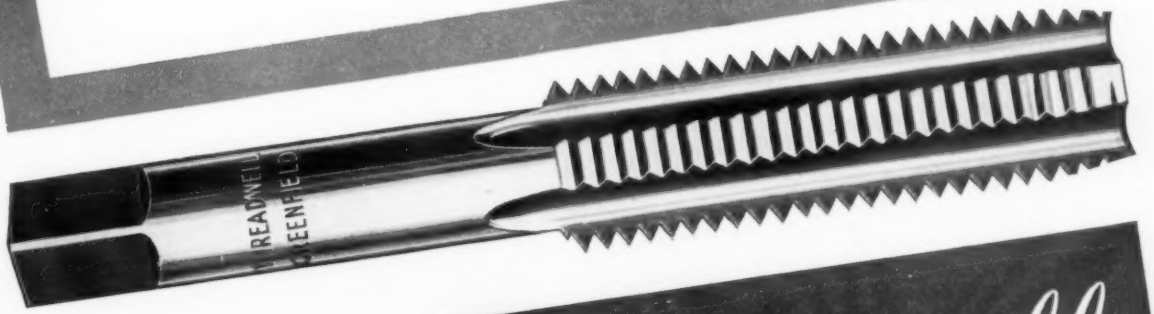

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● Designed and built to be driven at full capacity year after year these "New Series" Cleveland Open Side Planers are turning out more work, to closer tolerances, faster in hundreds of shops.

Here is a modern "All Electric" machine tool built to meet the most exacting requirements of a high speed, heavy production open side Planer. The improved head design insures greater rigidity in heavy cutting of high carbon steels.

Column base cast integral with closed top bed—newly designed rapid traverse—the centralization of controls of feeds and speeds—all contribute to its consistent accuracy and increased production.

A SMOOTH DRIVE

The entire driving mechanism illustrated is above floor level eliminating the need for an expensive foundation. Gears and shafts are of heat treated steel. The Herringbone Reduction Gears are of such *diameter* and *width of face* that the maximum amount of contact is obtained thus providing a smooth running drive, without end thrust.

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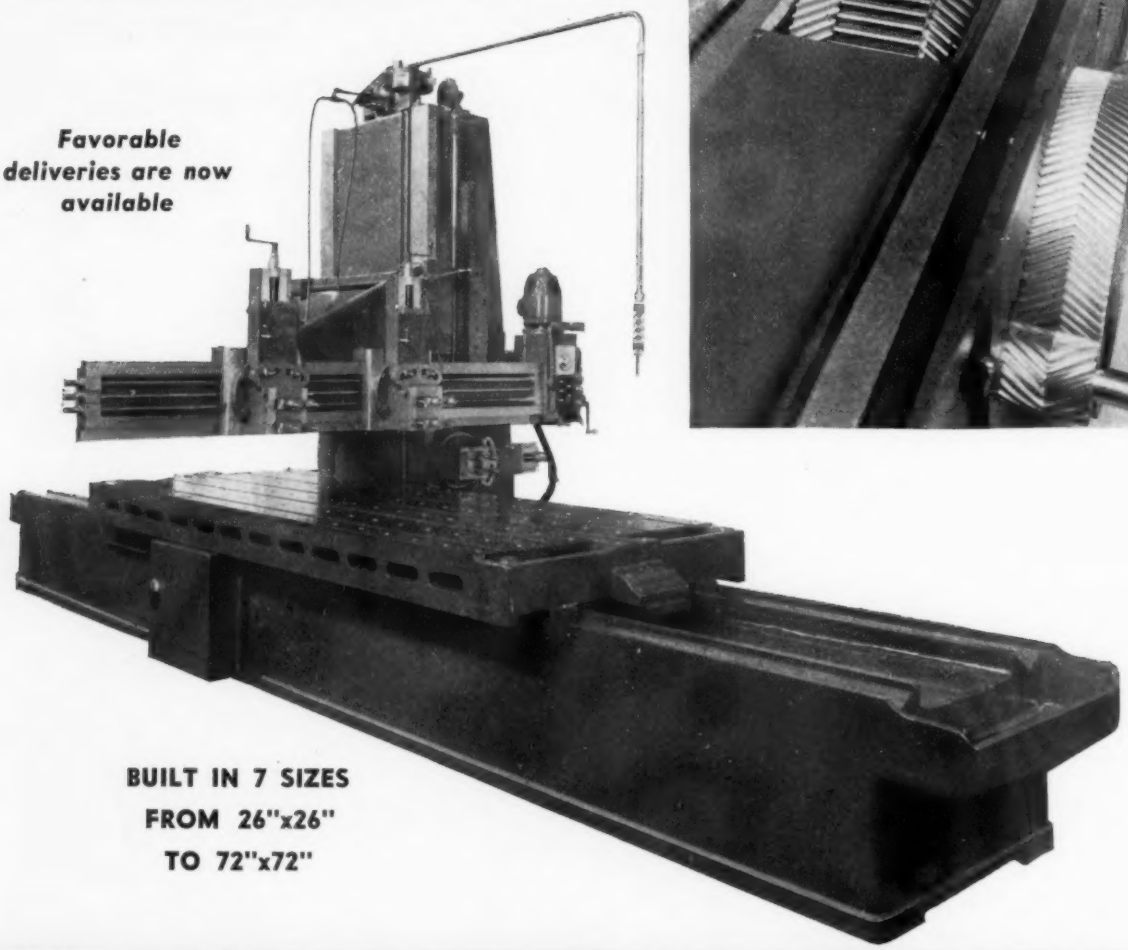

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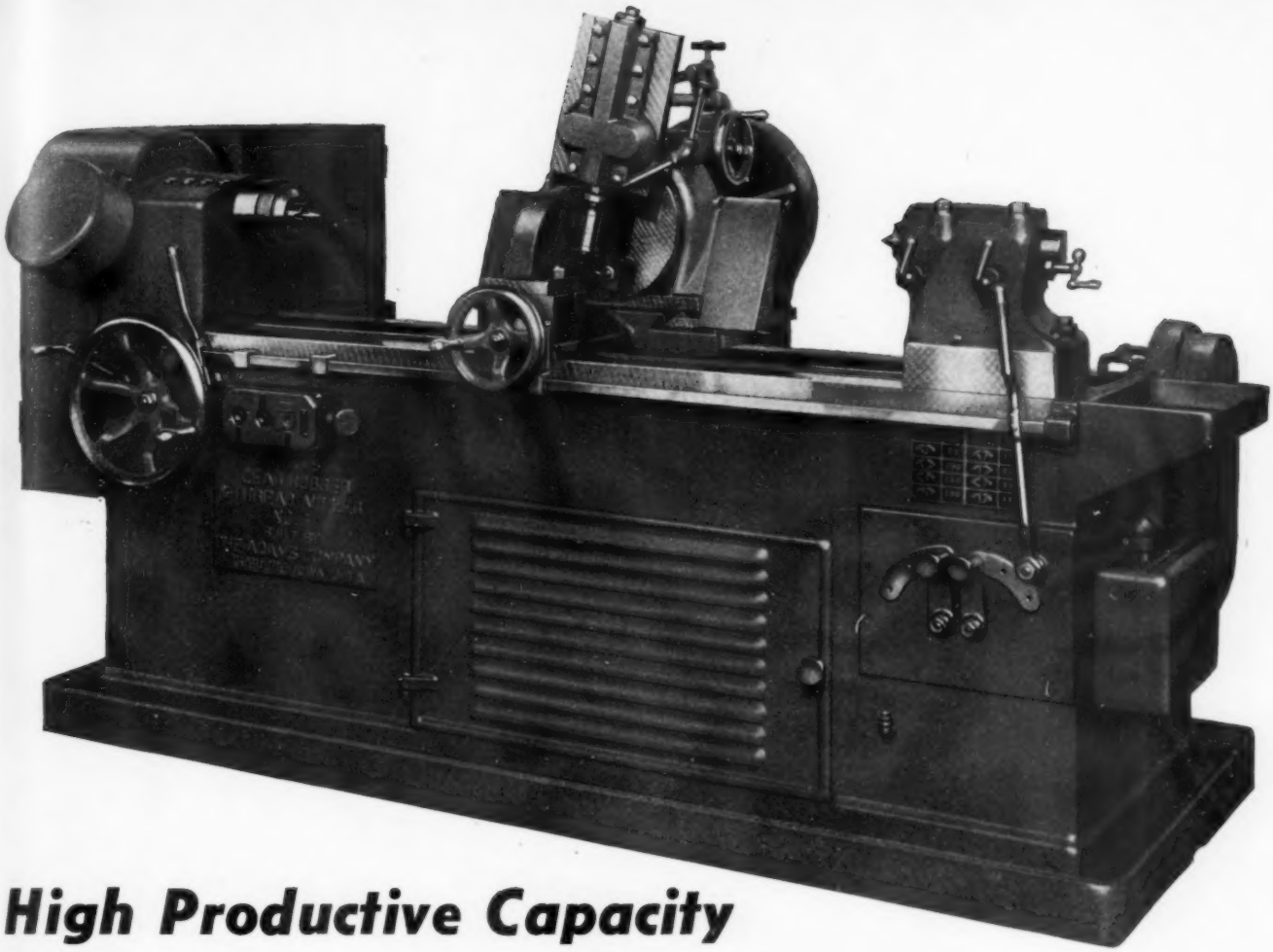

High Productive Capacity on Long or Short Runs—

The Adams Gear Hobber & Thread Miller

Accessibility of the work for rapid changing and simplicity of setups reduce idle time and make this a very convenient machine for short runs, just as its rigidity and precision make it desirable for production work.

Spur gears, helical gears, splined shafts, sprockets, ratchets and multiple threaded worms can be handled most economically by the hobbing method.

Worms, lead screws and feed screws, single or multiple threaded, can be produced by thread milling.

Capacity—10" diameter, 24" and 48" between centers. For high production of spurs and splines, investigate the Adams Manufacturing Hobber; capacity 8" diameter, 24" and 48" between centers.

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For 26 years, Lovejoy has been noted for prompt, efficient service. Even now, with the rush of war orders, you can expect Lovejoy to rush new Positive-Locking Milling Cutters to you with the least possible delay. We are working 24 hours a day to give the service you have always expected.

Special tools may take a bit longer, but we will be pleased to give you a promise that will be held.

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The famous Lovejoy Positive-Locking Blades will do double duty for you because they are interchangeable over a wide range of cutter sizes. Lovejoy users appreciate this feature—especially in the pinches! However, Lovejoy can supply you with all standard blades promptly from stock. But be sure to use your present type "A" blades to the limit (over 1/2 their length) before ordering new ones, thus conserving scarce material. High Speed Steel, Cemented Carbide, Stellite, and Rexalloy blades are stocked for immediate shipment.

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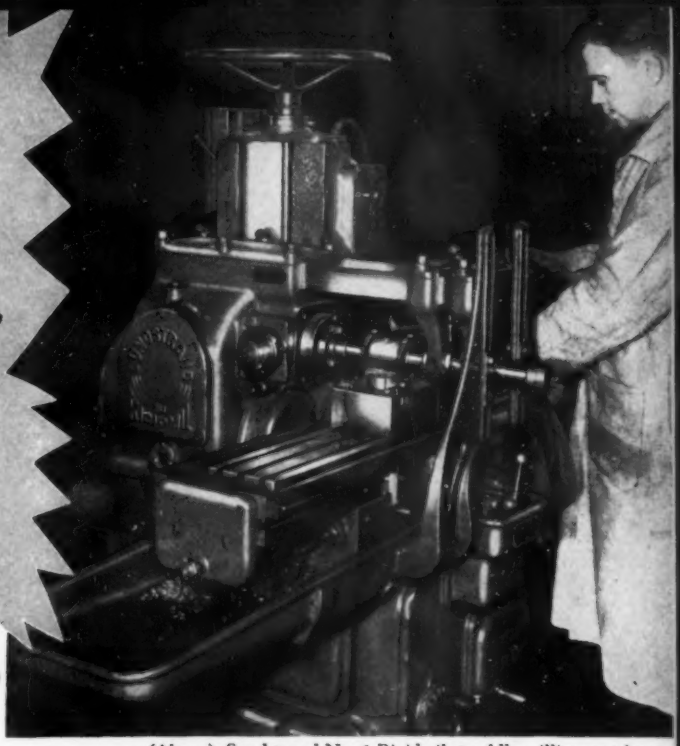
HOW TO MILL STEEL, CAST IRON AND ALUMINUM... *on One Machine!*



(Above) *Sundstrand No. 1 Rigidmil straddle milling cast iron.*

AMPLE FEEDS AND SPINDLE SPEEDS ON SUNDSTRAND RIGIDMILS ACCOMMODATE ALL THREE METALS

Your milling jobs in different metals can be done easily on Sundstrand Rigidmils. In addition, you can tool them up for production milling. With a vertical spindle attached head (extra equipment), the Rigidmil handles practically all types of milling operations in all metals.

74 SPINDLE SPEEDS IN 60 TO 1 RATIO

The high ratio spindle heads of Sundstrand Number 1 Rigidmils provide either one of two large speed ranges. The Type A has spindle speeds from 20 r.p.m. to 1200 r.p.m., Type B from 40 to 2400 r.p.m., both with 60 to 1 ratio and 74 possible speed changes. Here are speeds for every milling job in any metal for all cutter sizes within range of the machine.

INFINITELY ADJUSTABLE HYDRAULIC FEEDS

The wide range of hydraulic feeds, together with the large spindle speed range, permit adjustment for best possible cutting conditions and maximum production, regardless of metal being machined.

FOR SHORT OR LONG-RUN MILLING JOBS

The high rapid traverse and quick acting controls of Rigidmils reduce nonproductive time between cuts. Furthermore, unskilled help can consistently produce work at close limits, as the operator merely changes work pieces and starts automatic cycle.

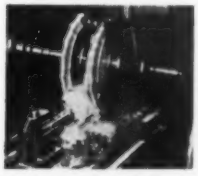
The simplicity of feed and speed adjustments — the ease of set-up and changeover—enable Sundstrand Rigidmils to offer similar production advantages on short-run work.

AUTOMATIC TABLE CYCLES

A variety of machining cycles, accurately controlled by easily adjusted dogs, are available on Sundstrand No. 1 Rigidmils.

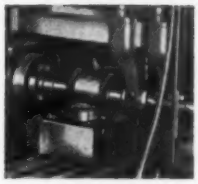
3 TYPICAL JOBS...

Illustrated below are three widely different jobs as performed on a Sundstrand Number 1 Rigidmil.



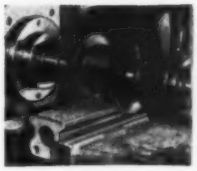
STEEL

Straddle milling at 25 r.p.m. and 52 surface feet per minute.



CAST IRON

Milling face and straddle milling lugs at 104 r.p.m. and 100 surface feet per minute.



ALUMINUM

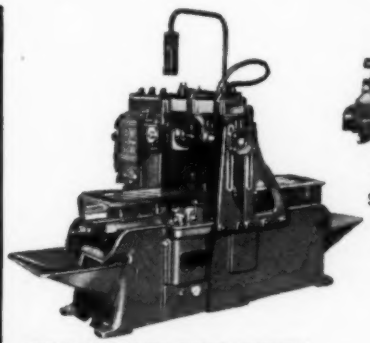
Slab milling base and straddle milling sides at 1200 r.p.m. and 1180 surface feet a min.

R MAXIMUM PRODUCTION . . . CONSULT SUNDSTRAND ENGINEERS

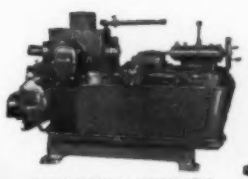
Sundstrand engineers are available to make recommendations on productive machining. Having wide experience in milling and turning makes it possible for them to suggest changes which increase production...lower cost. Use this service freely. Send complete information with inquiry.

GET THIS FREE MILLING DATA

All cycles and important information on Sundstrand No. 1 Rigidmil are contained in this bulletin. Ask for Bulletin No. 110.



SUNDSTRAND FLUID SCREW RIGIDMILS ...AVAILABLE IN 3 MODELS



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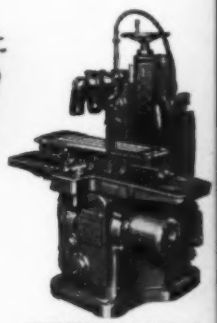

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A Handful of Help

FOR USERS OF OK TOOLS

LOOK FOR THESE TAGS ON OK TOOLS

When you receive an OK Tool with one of these tags attached to it, in your own interest, be sure to remove and read it carefully. These tags all contain information that will go far to make the tools last longer and do better work . . . useful hints about metal cutting in general, how to reblade, etc.

There's a wrong and a right way to use a cutting tool. In these days, when machine operators are still in the learning stage, they need simple, practical help. In the main, this should come from the "old man" in charge of the department, but the information on these tags will afford the novice a good beginning.

INSERTED-BLADE METAL CUTTING

TRADE OK MARK TOOL SYSTEM

MANUFACTURED ONLY BY THE O K TOOL COMPANY, SHELTON, CONN., U. S. A.

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. . the tool that converts drilling machines into key-seaters and saves time and money

• With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

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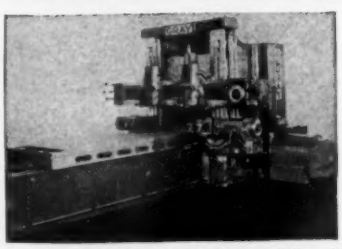

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MILLING MACHINES (Planer Type)
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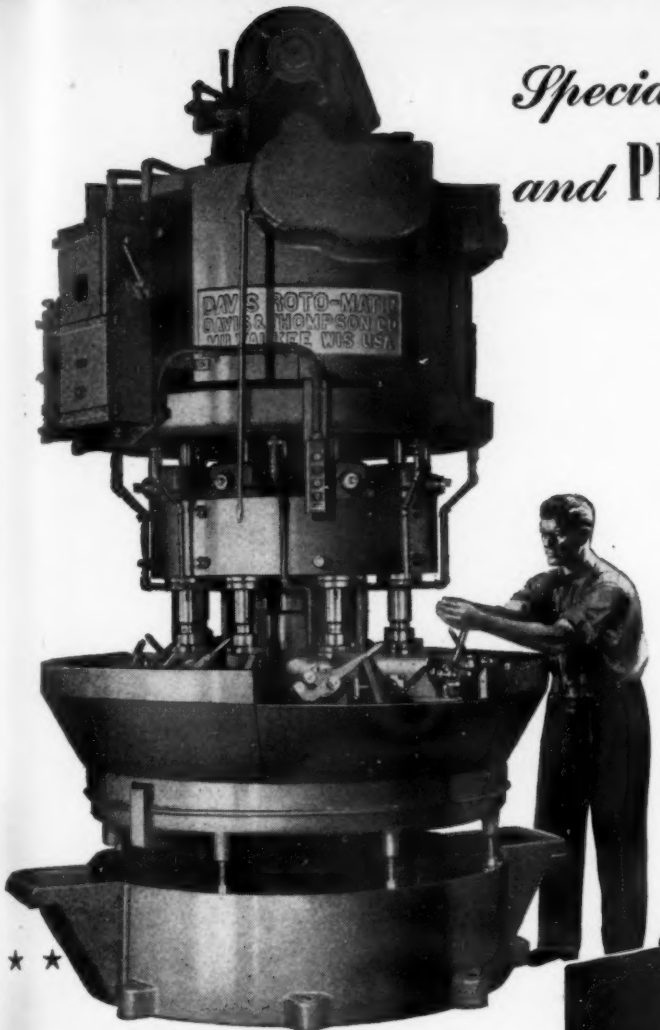
CINCINNATI, OHIO

Specially Designed for the SPEED *and* PRECISION *Victory* DEMANDS



★ ★

480 precision parts for bombs can be milled per hour, automatically, on this specially designed 8-Spindle Heavy-Duty D & T Miller. The work-piece is clamped in specially constructed milling fixtures, Fixtures are actuated by a cam. One operator does the loading and unloading. This is one of many examples of D & T Machines in production for Victory!

High-speed, automatic precision machines designed and built by Davis & Thompson engineers are helping many metal-working manufacturers meet the demands of Victory production.

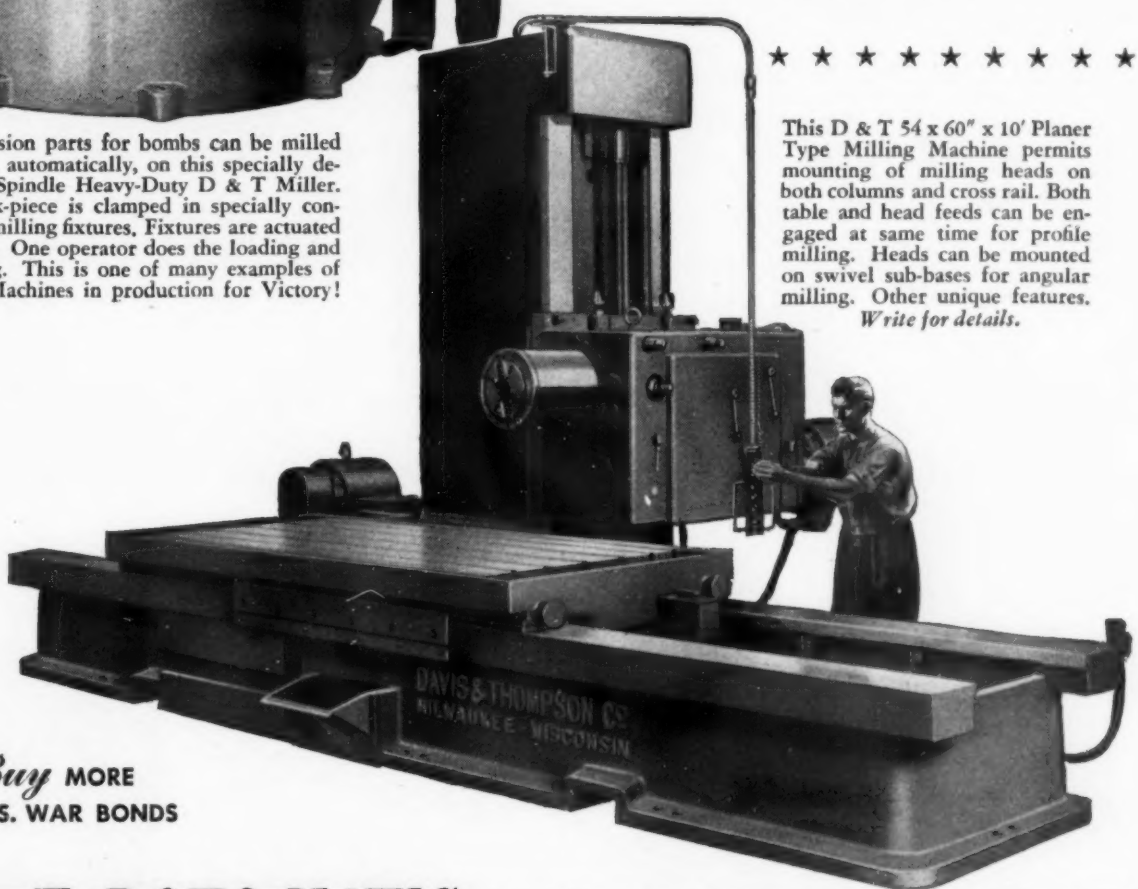
Multiple spindle milling, drilling, boring machines created by D & T for specific jobs, combine many machining steps into fast, automatic operating cycles, in many cases producing hundreds of precision parts *per hour* at speeds never before considered possible. These machines... so simple, automatic and accurate that even semi-skilled operators can maintain peak production records... conserve critical materials, precious time and vital manpower. High production at low cost will continue to be our aim throughout "the duration" and on into the post-war era.

DAVIS & THOMPSON CO., Milwaukee, Wis., U.S.A.

Write for the Book
"VICTORY PRODUCTION"

★ ★ ★ ★ ★ ★ ★ ★ ★ ★

This D & T 54 x 60" x 10' Planer Type Milling Machine permits mounting of milling heads on both columns and cross rail. Both table and head feeds can be engaged at same time for profile milling. Heads can be mounted on swivel sub-bases for angular milling. Other unique features. *Write for details.*

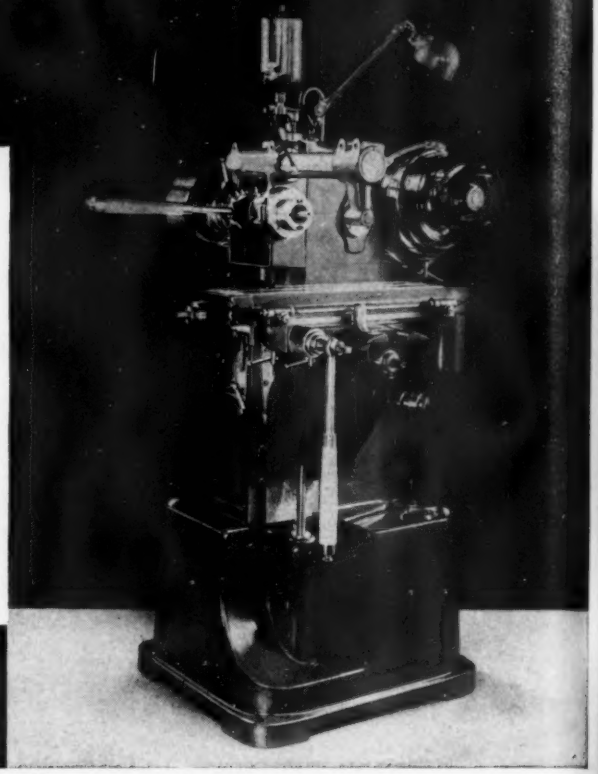


Buy MORE
U. S. WAR BONDS

D&T ROTO-MATIC HIGH PRODUCTION MACHINERY

THE NICHOLS HAND MILLING MACHINE

handles a wide variety of parts at high speed and low cost . . . .



This sturdy, versatile, precision machine—the latest development in this type of hand miller—incorporates features which increase its utility and ability to handle a wide variety of operations at high speed and low cost as compared with larger, slower machines.

Because of its ease of set-up, high cutting speeds and maintained precision, together with elimination of unnecessary friction, it is ideally suited to tool room production requirements. In proportion to its price, the "NICHOLS" is considered one of the most productive machine tools in the field. Its wide use in modern shops is outstanding evidence of its indispensability for today's requirements.

CONDENSED SPECIFICATIONS

Longitudinal Feed—10"
Traverse Feed—7"
Vertical Feed of Knee—13½"
Vertical Movement of Head—4½"
Spindle speeds—100, 200, 600 and 1200 R.P.M.

Write for Illustrated Bulletin, giving complete information

W. H. NICHOLS & SONS
WALTHAM, MASS., U.S.A.

1905 **Strand** 1943

FLEXIBLE SHAFTS

FLEXIBLE SHAFTS MACHINES ROTARY CUTTERS AND ROTARY FILES

ROTARY CUTTERS

Are playing an important part in this Victory parade of the Allies.

Type RFM 4-¼ H.P.

Strong, substantial machines are required these days. The fewer the breakdowns the quicker this war will be over. Use Strand equipment for results.

Send for Catalog
60 Types and Sizes

N. A. STRAND and CO.
5001 No. Wolcott Ave. Chicago

Carbide and Diamond-tipped
GAGES AND TOOLS
GUARANTEED QUALITY

ARTHUR A. *Crafts* COMPANY, INC.
Chicago 532 COMMONWEALTH AVE. *Detroit*
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Give your Inspectors, Toolmakers and Machinists better eyes for better work . . . . with the

PORTABLE INSPECTO-GRAPH

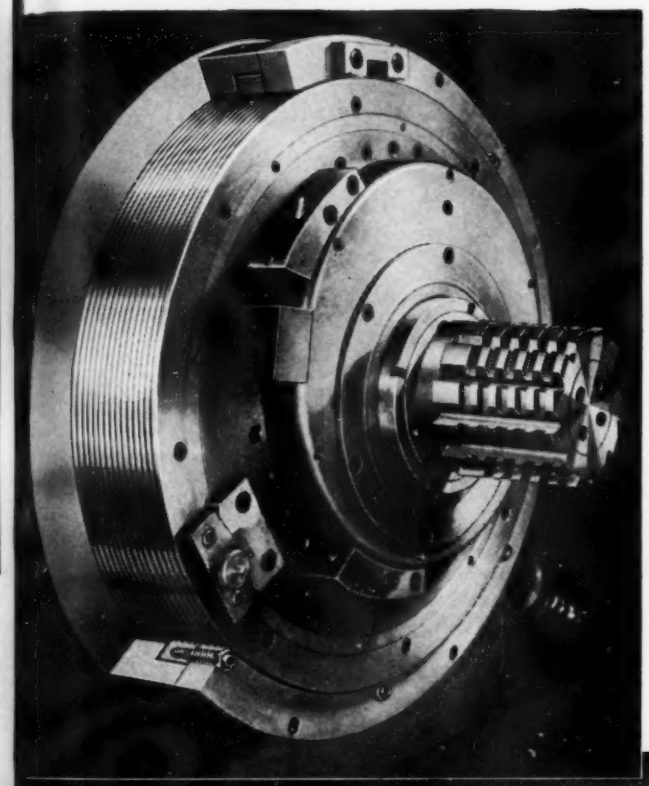
Can be used anywhere by merely plugging into nearest 110 volt A.C. outlet. Two fluorescent tubes concentrate shadowless, diffused light on object to be inspected. Large four-inch lens magnifies work without distortion. Saves workmen's eyes and quickly detects defective parts.

Price $35.00

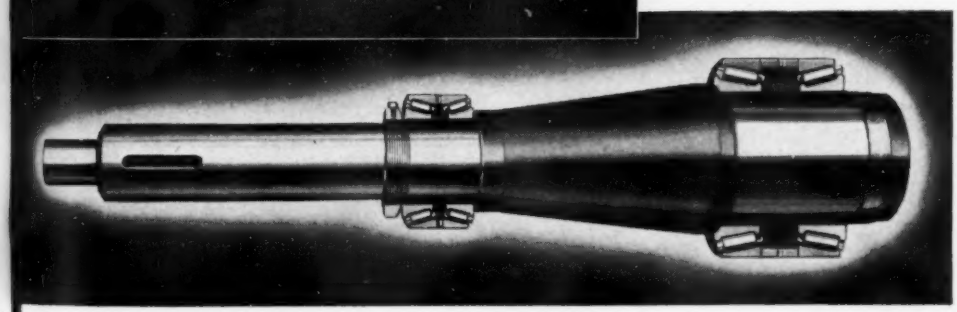
Write for descriptive literature.

S. LOWE & SONS CO.
20 Sanford St., Fairfield, Conn.

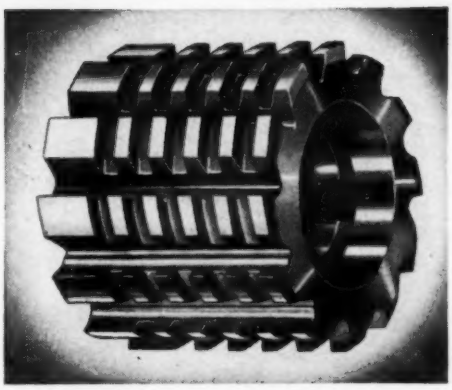
The PLAN-O-MILL *is Accurate!*



ONE big reason why Plan-O-Mill form and thread milling machines are obsoleting older and bulkier equipment is their ability to *produce*. But alongside Plan-O-Mill's amazing production record is a standard of accuracy that many slower, less productive machines are unable to attain. Extra large LEAD SCREW, shown in cutaway view at left, insures extreme thread accuracy—yet even the largest threads are plan-o-milled with a single pass of the cutter!



● The massive Plan-O-Mill SPINDLE (above) revolves on pre-loaded bearings, carries the cutter on a true, vibrationless path. Plan-O-Mill THREAD MILLING CUTTERS (right) are made with the same regard for precision that is evident throughout Plan-O-Mill manufacture. For more information on how Plan-O-Mill can do your threading and form-milling job better, faster, and more accurately, contact the Plan-O-Mill dealer nearest you. See list at right.



PLAN-O-MILL CORPORATION, Hazel Park, Royal Oak, Mich.

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NEW YORK, N. Y.
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Standard Machinery Tool Co.

MILLING MACHINES
PLAN-O-MILL
MILLING CUTTERS

WALTHAM PINION and GEAR CUTTERS

. . . for high speed production of fine pitch mechanisms

Small parts such as used in watches, instruments, time fuses, etc. can be produced in quantity and to closest accuracy on these easily handled machines. In all Waltham machines, the operation consists of a revolving cutter making successive cuts on blanks held and indexed by the work spindle and usually supported by a tail center. Only straight teeth can be cut. The following types of machines are available with either countershaft or individual motor drive:

SINGLE-CUT PINION MACHINES

Employs one cutter. Blank is positioned and machine started by hand. Other movements are automatic.

MULTIPLE-CUT PINION MACHINES

For use where second or third cut is necessary. These machines employ two or three cutters spaced on arbor of cutting spindle.

MAGAZINE-FED PINION MACHINES

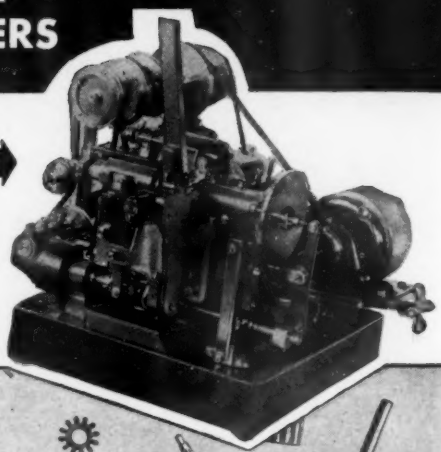
For continuous production of one kind of pinion. A fully automatic magazine fed machine (except for loading).

GEAR CUTTING MACHINES

Single and Multiple-Cut Machines equipped with special cutter swing can be used to cut teeth on gears up to 1½" pitch diameter.

Complete specifications of Waltham Pinion and Gear Cutting Machines available on request.

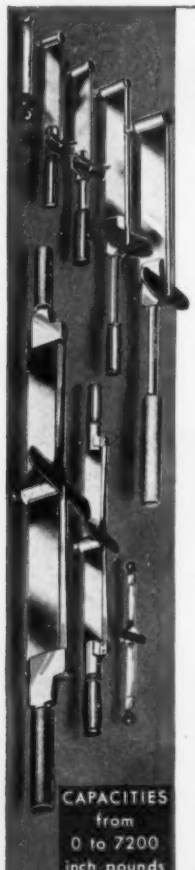
Waltham Motor-drive Magazine-Feed Pinion Machine. Capacity (approx.) ½" diameter.



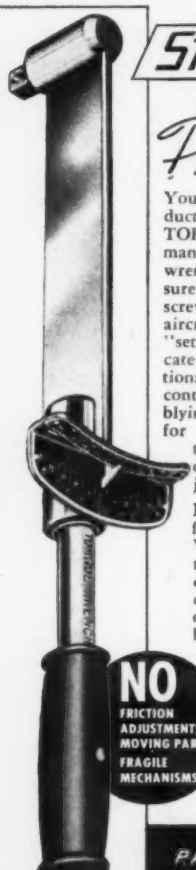
Typical work produced on Waltham Pinion and Gear Cutters.

WALTHAM MACHINE WORKS WALTHAM MASS.

WALTHAM TRADE MARK REGISTERED U.S. PAT. OFF.



CAPACITIES from 0 to 7200 inch-pounds



STURTEVANT QUALITY Protect!...

You too can protect your production with STURTEVANT TORQUE WRENCHES—the permanently accurate measuring wrenches which are used to assure the uniform tightening of screws, nuts and bolts, in most aircraft engines, to control the "set" of threaded parts in delicate instruments, to test the frictional drag in giant diesels—for controlled uniformity in assemblying, for rapid inspection . . . for testing, gauging, measuring torque applied directly or indirectly thru innumerable jigs.

Each day brings new uses for STURTEVANT TORQUE WRENCHES, new applications where they speed production, increase operation control and assure product quality. These patented flat beam wrenches, produced by the pioneer manufacturer of accurate torque wrenches, have double-faced dials, readable from any working angle, practically indestructible and above all are *permanently accurate!*

NO FRICTION ADJUSTMENTS MOVING PARTS FRAGILE MECHANISMS

P. A. STURTEVANT CO. ADDISON QUALITY ILLINOIS

FOR INTERCHANGEABLE MARKING USE . . .

The "Champion" STEEL TYPE HOLDER

The "Champion" steel type holder (Patented) permits rapid interchangeable marking of flat, curved, concave or convex surfaces . . . assuring alignment and perfect spacing of characters. Pressure of thumb on spring actuated button releases type for instant changing. Holder shown is hand style. Also made with shank, for press production marking.

Construction

Quick Changing

"Champion" Holders and "Tuf-Face" type are furnished in partitioned wooden boxes as illustrated, for easy handling and for keeping type in place. Cross-sectional view shows simple, fool proof type changing mechanism. Write for information and prices.

JAS. H. MATTHEWS & CO.

MATTHEWS MARKING DEVICES

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New York, Boston, Chicago, Philadelphia, Newark, Syracuse

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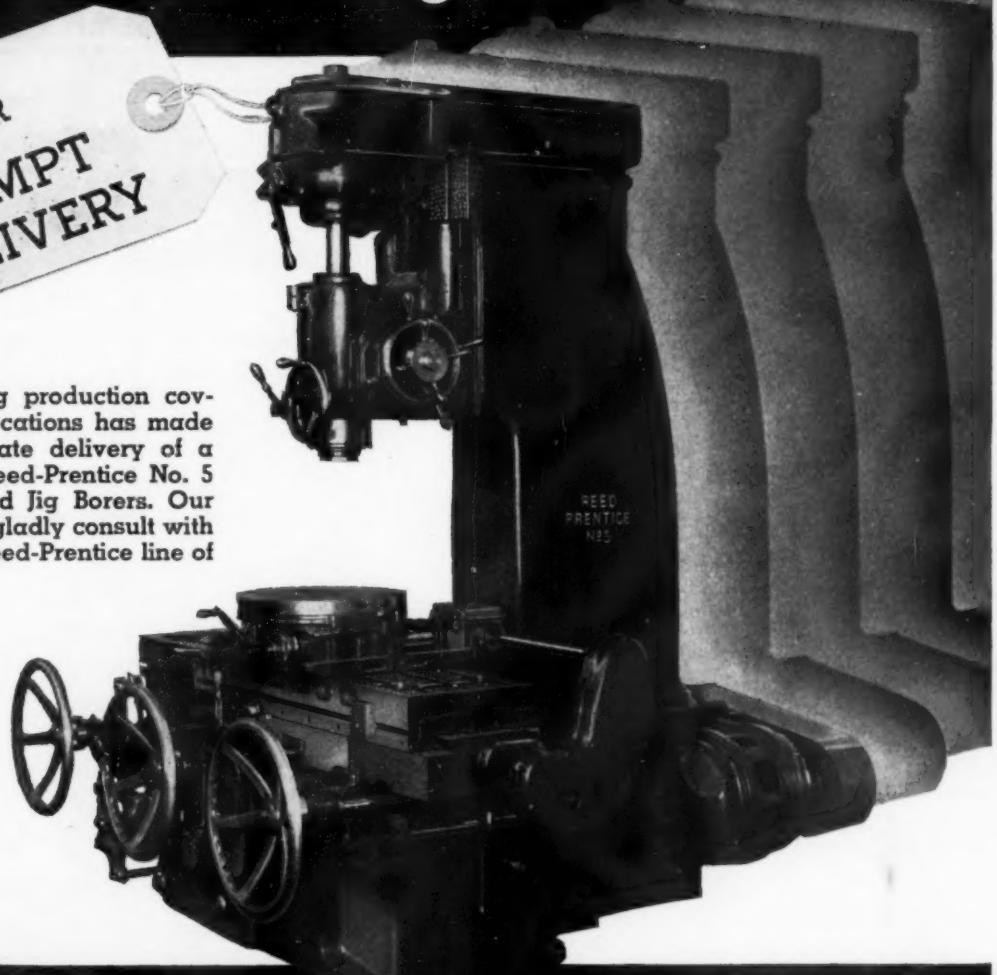
Cleveland Detroit Hartford Birmingham

REED-PRENTICE No. 5

OK FOR PROMPT DELIVERY

Constantly increasing production covering pool order allocations has made possible the immediate delivery of a limited number of Reed-Prentice No. 5 Milling Machines and Jig Borers. Our Sales Engineers will gladly consult with you relative to the Reed-Prentice line of Machine Tools.

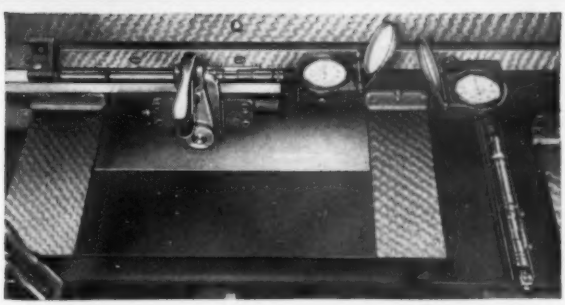


for MILLING ★ ★ ★ JIG BORING

The Reed-Prentice No. 5 Vertical Milling Machine is a fast, rugged, accurate, and efficient miller which will fulfill your most exacting requirements. Used as a die-sinker it is especially efficient in the making of drop-forging and die-casting dies.

SPECIFICATIONS

Longitudinal power feed	48"
Cross power feed	16"
Table working surface	60" x 16"
Vertical adjustment head on column	15"
Vertical feed of spindle	9"



The No. 5 Jig Borer is equipped with precision measuring devices (as shown above) for extremely accurate operations on jigs and fixtures.

ARMY ★ NAVY

BRANCH OFFICES
1213 W. 3rd. St.
Cleveland, Ohio
75 West St.
New York City, N. Y.

REED-PRENTICE CORP.

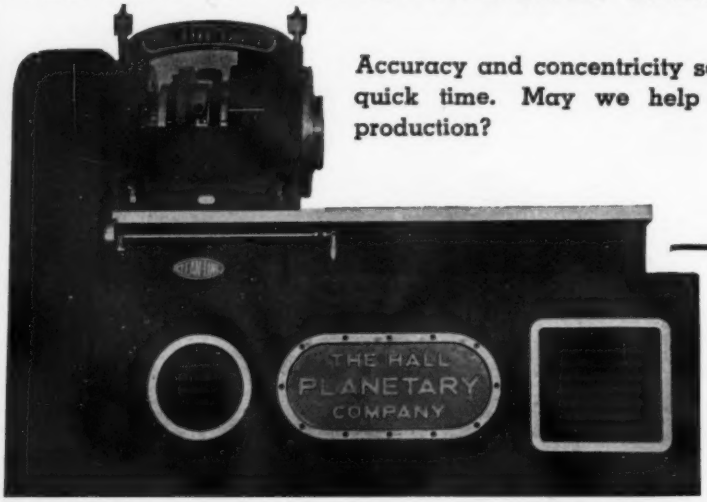
MAIN OFFICE
WORCESTER
MASS. U. S. A.

PLANAMILLING & PLANATHREADING

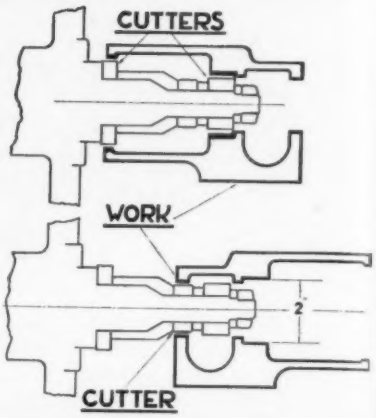
THE HALL PLANETARY MILLER

Two operations—Planamilling and Planathreading—performed in sequence on the same machine.

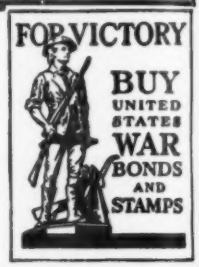
THE TIME IS 1 MINUTE FOR EACH OPERATION

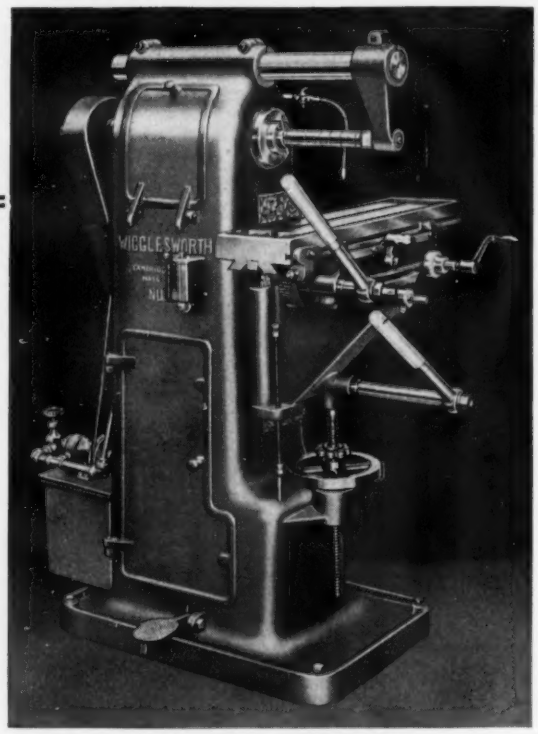


Accuracy and concentricity secured in quick time. May we help in *your* production?



HALL PLANETARY COMPANY
Fox & Abbotsford Ave., Philadelphia, Pa.





CONDENSED SPECIFICATIONS

Lever feed to table, 10" — Crank or power feed to table, 20" —Transverse Feed, 5½" — Vertical motion to knee, 10" — Max. dist. spindle to table, 10" — Table working surface, 7" x 20" — Speeds (6), from 150 to 800 R.P.M.

THE NEW No. 3 WIGGLESWORTH

HIGH SPEED SMALL PARTS MILLING MACHINE . . .
with Motor in base drive . . . Timken Bearing Spindle . . .
Power longitudinal feed . . . and "Built in" Accuracy . . .

This new, high speed miller provides versatility, simplicity, rigidity and accuracy in small parts production. It can be depended on to save time and assure high production on a wide range of milling jobs. Adaptability for production milling is provided by a special single "T" slot table in place of regular three "T" slot equipment.

MODERN IN EVERY DETAIL

Outstanding features include:

. . . table feed either by hand or power; power longitudinal feed is simple, rugged, and powerful and smooth insuring fine finish.

. . . hardened and ground spindle runs in two Timken precision roller bearings, assuring accuracy and rigidity.

. . . feed gear mechanism consists of planetary gears which give proper reduction of spindle speeds for correct rates of feed.

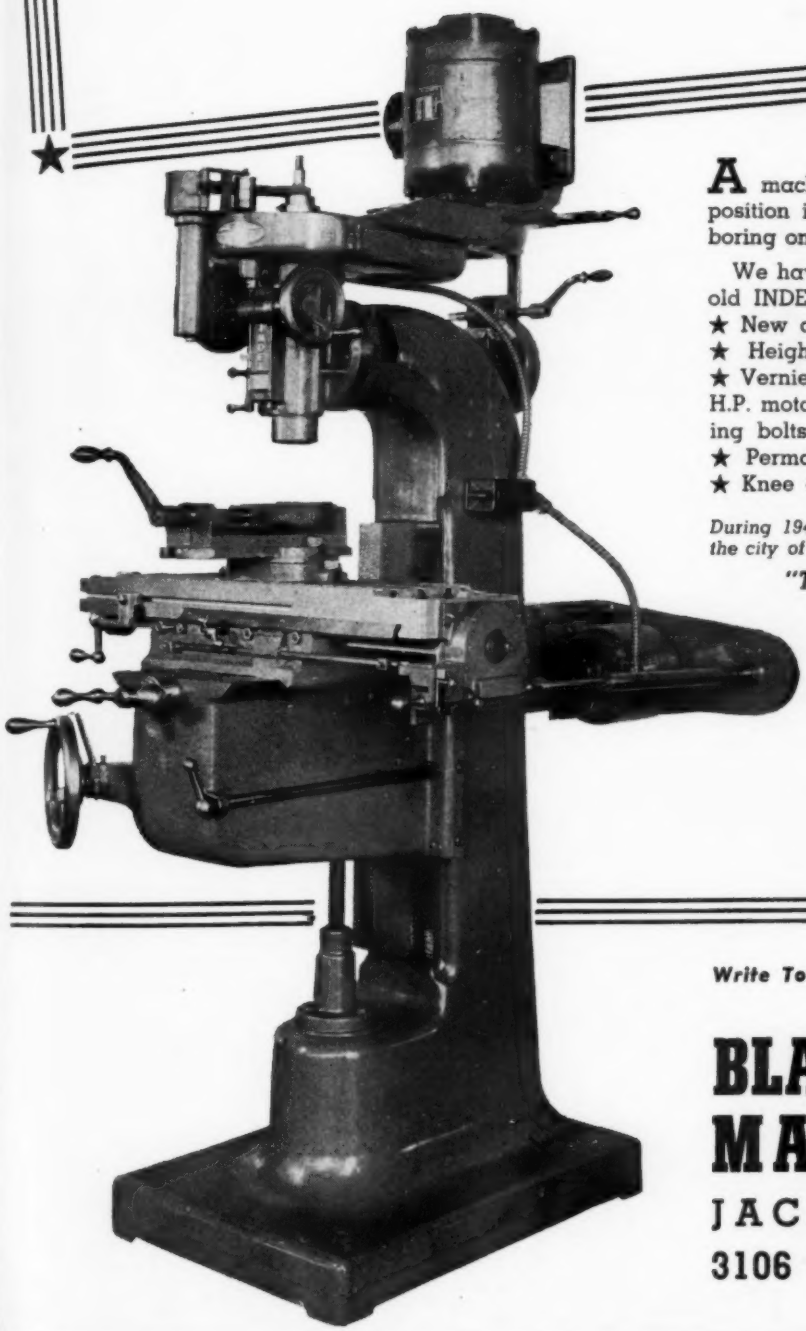
. . . drive is by V-belt from motor in base through intermediary shaft to spindle.

IMMEDIATE DELIVERY WITH PROPER PRIORITY

Send for Complete Details

WIGGLESWORTH MACHINE TOOL CO., 195 Bent St., Cambridge, Mass.

The New INDEX MILLS for 1943



A machine which has already taken a prominent position in the Victory program milling, drilling and boring on tool, die, experimental and production work.

We have incorporated all of the fine features of the old INDEX . . . PLUS these NEW ADDED FEATURES— ★ New and heavier column, knee, saddle and table ★ Height increased four inches — floor to spindle ★ Verniers mounted on angle for easy reading ★ ½ H.P. motor ★ Motor supporting brace ★ Three clamping bolts head to column ★ Power feed to spindle ★ Permanent table stop ★ Graduated hand wheel ★ Knee clamp extended to front.

During 1942, there were well over 200 INDEX MILLS sold in the city of Detroit alone . . . The majority being repeat orders,

"Those that's got 'em. . . . Like 'em."

Manufactured by

Index Machine & Tool Company

Write Today For Descriptive Folder From Sales and Distribution Agents

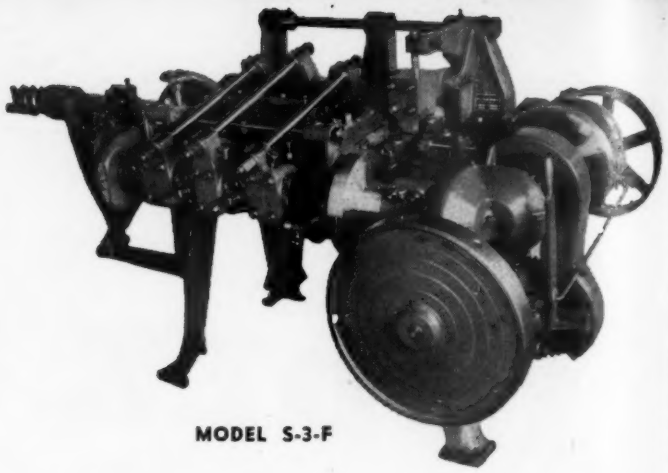
BLANK & BUXTON MACHINERY CO.

JACKSON, MICHIGAN

3106 East Michigan Avenue

STEP UP PRODUCTION OF FORMED PARTS

. . . *with the* NILSON AUTOMATIC METAL and WIRE FORMING MACHINES



MODEL S-3-F

Today's requirements for higher efficiency, greater speed and products of greater uniformity and accuracy are met in the new NILSON RIBBON STOCK FORMING MACHINES. These machines are the achievement of over fifty years accumulated experience in designing and building metal forming machines. Careful selection of materials and skilled workmanship result in machines that are famous for long life and low maintenance.

FEATURES THAT CONTRIBUTE TO BETTER, FASTER WORK

Superior features of the NILSON four-slide forming machines are the result of long experience and include:

. . . open construction of press and forming tools.
. . . patented slide feed which has an independent cam-operated wire gripping device.
. . . transmission of power operating wire feed through a straight line.

Send for 4-page circular giving further information as well as detailed specifications of sizes and capacities.

• •

We have been engaged in the design and production of special automatic machinery of high production capacity for over thirty years. We are prepared to render a complete service in connection with the design and production of automatic machinery of every description. Consult Nilson on your requirements.

THE A. H. NILSON MACHINE CO... *Bridgeport, Conn., U.S.A.*

OUTSIDE MEASURE:
Master "Streamline" calipers all outside measurements up to 6 feet—accurate to .005"!
INSIDE MEASURE:
You read actual measurement direct from blade at point on case — no adding or subtracting.
SPARE BLADE:
Exclusive feature. Slip in a new blade any time like getting two rules for the price of one.
MASTER
Streamline
6 FT. STEEL TAPE RULE

ACCURACY FOR SALE

You can save hours of "cut and try" — work to closer tolerances — get better fit and finish in the things you make — by using Master "Streamline". This finest of 6-foot steel tape rules is a precision measuring instrument that gives your natural skill a break, gives you a fair chance to do your best work on every job. If your hardware dealer doesn't have it, use coupon to order direct. For speed, ease and accuracy, get "Streamline" today! 3724

Master Rule Mfg. Co., Inc., Dept. P3
815 E. 136th St., New York City

Enclosed find $2.65 for which send postpaid one Master "Streamline" 6-ft. steel tape rule complete with spare blade.

Name_____

Address_____

MARK IRON, STEEL and CARBIDES

The Original

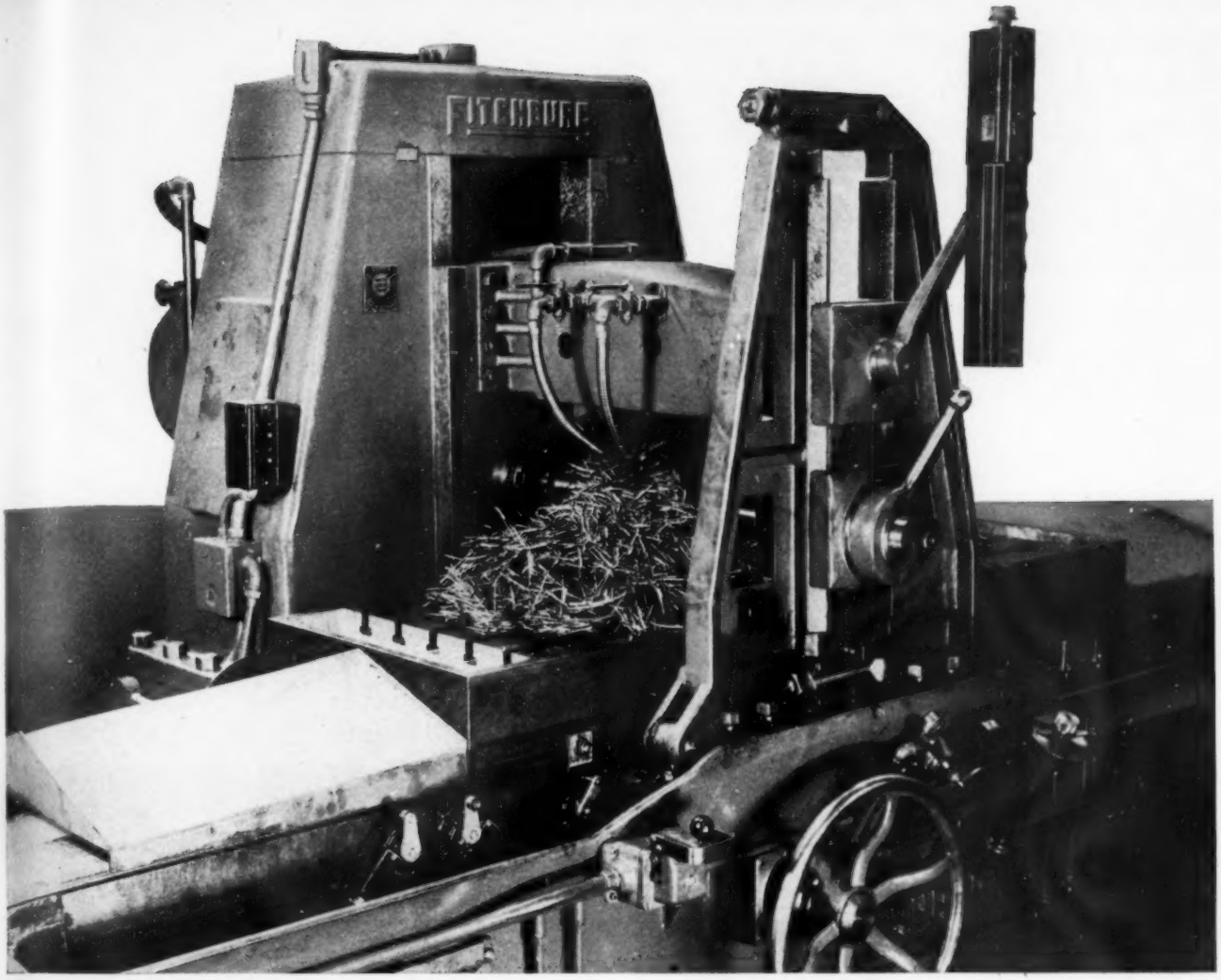
Etchograph

Way

Mark parts in process, tools, dies, gages and fixtures of any ferrous metals including the hardest alloys and carbides—quickly—plainly.
Three sizes to meet all requirements.

Write for circular and prices

BREWSTER-SQUIRES & CO.
50 CHURCH ST. **NEW YORK, N. Y.**



FITCHBURG

Heavy Duty Climb MILLING MACHINE

. . . busy on War Work

This Fitchburg machine is equipped with special climb milling feed to the table in both directions—a feature consisting of a combination hydraulic and screw feed. Feeding is handled by the hydraulic cylinder and rate of feed controlled by screw.

Machine is equipped with a table 24" wide and 72" long; feed travel is 72". The milling head is equipped with a 5" diameter spindle driven by a 25 H.P. motor.

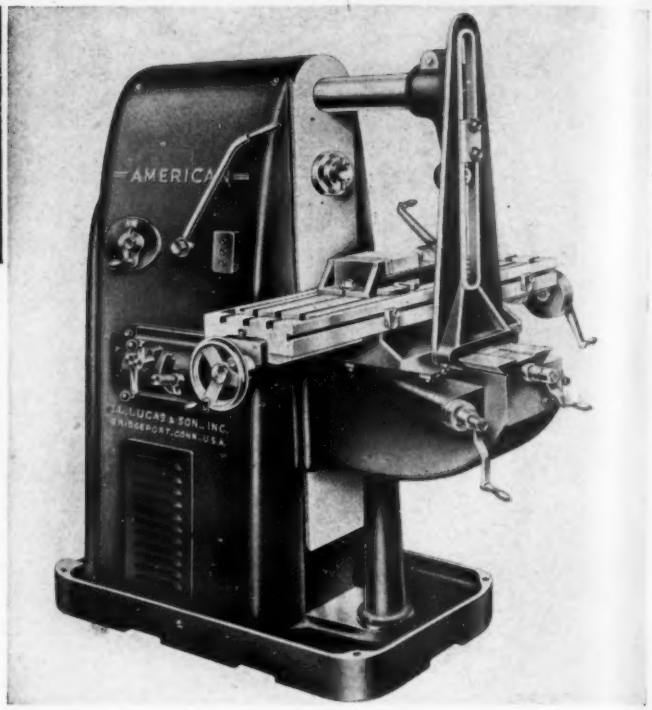
Operations and work handled on this machine include slab milling of airplane crankshafts across the broad face of the web as well as heavy duty climb milling on large turbine blades, the blades being formed from bar stock.

If you have a war production problem involving heavy duty milling, consult Fitchburg for advice and assistance.

FITCHBURG ENGINEERING CORPORATION

FITCHBURG, MASSACHUSETTS

POWER, VERSATILITY AND OPERATIVE CONVENIENCE TO SPEED ARMAMENT WORK *are assured by the* No. 2 AMERICAN PLAIN MILLING MACHINE



OUTSTANDING FEATURES

. . . spindle of chrome nickel steel, heat treated, accurately ground to size, running in heavy phosphor bronze bearings compensated for wear and equipped with alemite lubrication fittings.

. . . infinite spindle speed variation with machine in operation; a single direct-reading dial control in easy reach of operator provides for instant variation.

. . . longitudinal and transverse power feed; vertical hand feed.

. . . all operating levers and controls located for convenient manipulation.

. . . table working surface arranged with large oil pockets and with three T-slots.

. . . standardized flanged spindle nose with No. 40 taper.

. . . U.S. Vari-Drive ball bearing motor in base, with drive through multiple V-belt.

CONDENSED SPECIFICATIONS

Table Working Surface — 46" x 10½"
Longitudinal Power Feed — 25"
Transverse Power Feed—9"
Vertical Hand Feed—19"
Geared Feeds—16
Range per revolution of spindle .005" to .212"
Spindle Speed Range—25-500 R.P.M. (Infinite)

INVESTIGATE!

PROMPT SHIPMENT ON HIGH PRIORITIES

J. L. LUCAS & SON, INC.
BRIDGEPORT, CONN., U. S. A.

TIME SAVER

The rawhide hammer designed for easy refacing . . .

Just loosen the nut and reface this rugged hammer with rawhide, babbitt or copper in a jiffy. Split-head made of tough alloy steel . . . handle of seasoned hardwood. Five sizes carried in stock by leading mill supply houses. Also EMPIRE All-Rawhide Mallets.

BASA
Replaceable Face
HAMMER

GREENE, TWEED & CO. • Bronx Blvd. at 238 St., New York, N.Y.

TORNADO Electric Writing Tools and Etchers

Protect Valuable Tools!

TORNADO Electric Writing Tools and Etchers mark everything of value that might be lost, misplaced or stolen. TORNADO Writing Tool marks brass, marble, tile, glass, plastics, wood, hard rubber, aluminum, steel and bronze.

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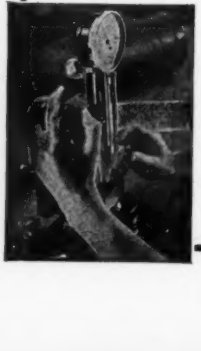
TORNADO Electric Writing Tool. Used for marking everything. Easily portable.

Write for complete details

BREUER ELECTRIC MFG. CO.
5084 N. Ravenswood Ave., Chicago

HARDNESS TESTER

Let the SCLEROSCOPE speed up the production of that s so we can blow the Axis to HELL



Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.
9025 VAN WYCK AVENUE
JAMAICA, NEW YORK
TELEPHONE: JAMAICA 6-4090

The New
LIBERTY
48"x48" DOUBLE HOUSING MEDIUM DUTY
PLANER

★

Improved design—incorporates many features of the Liberty Heavy duty and standard design planers. Provides the most critical user with an efficient, economical machine for medium class planer work.

- Double length bed.
- Pressure lubricated Vees.
- Box type table has "T" slots machined from solid.
- Extra heavy box type housings, bolted and doweled to bed.
- Sturdy cross brace at top assures sustained rigidity.
- Deep box type cross rail is individually motorized for elevating.
- Friction feed and rapid traversing mechanisms for rail head are immersed in oil and located along with simplified control at end of rail.

Rail heads are provided with automatic pneumatic tool lifters.

Two heavily designed counter-balanced side heads can be moved below top of table when not in use.

Equipped with steel, high speed, herringbone primary drive gear for smooth, fast and accurate operation.

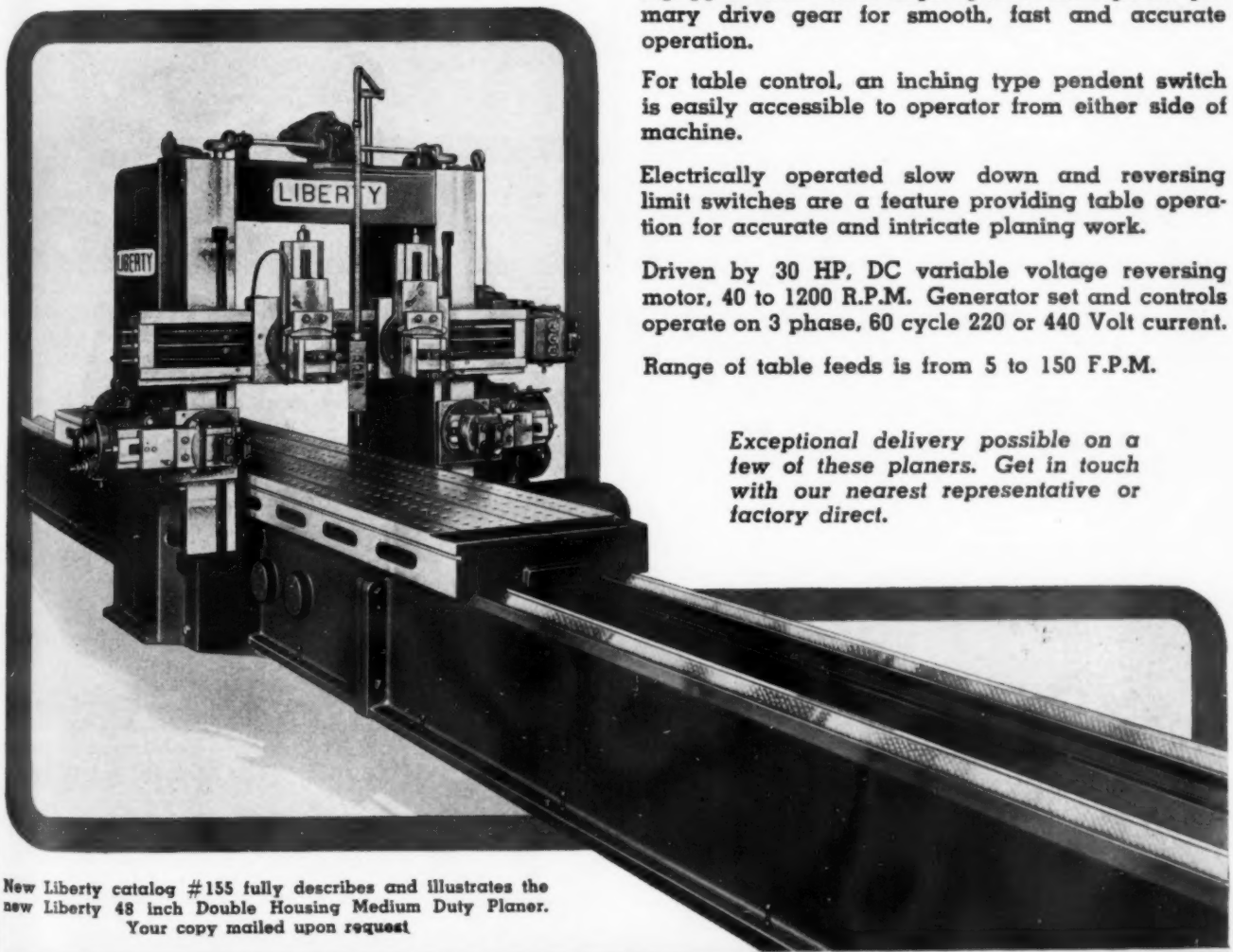
For table control, an inching type pendent switch is easily accessible to operator from either side of machine.

Electrically operated slow down and reversing limit switches are a feature providing table operation for accurate and intricate planing work.

Driven by 30 HP, DC variable voltage reversing motor, 40 to 1200 R.P.M. Generator set and controls operate on 3 phase, 60 cycle 220 or 440 Volt current.

Range of table feeds is from 5 to 150 F.P.M.

Exceptional delivery possible on a few of these planers. Get in touch with our nearest representative or factory direct.

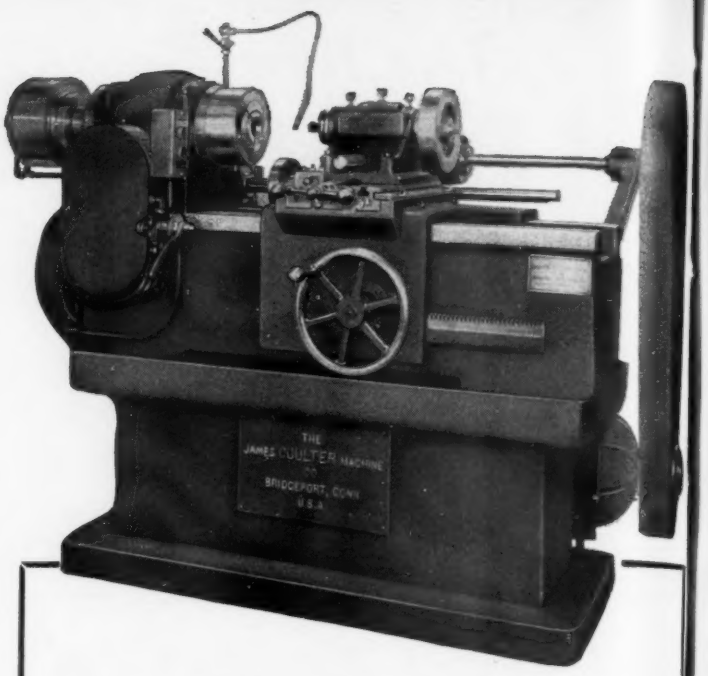


New Liberty catalog #155 fully describes and illustrates the new Liberty 48 inch Double Housing Medium Duty Planer. Your copy mailed upon request

LIBERTY PLANERS

1006 WELLER AVENUE HAMILTON • OHIO

Keep Ahead of DEFENSE DEMANDS on the PRODUCTION of EXTERNAL and INTERNAL THREADS



The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

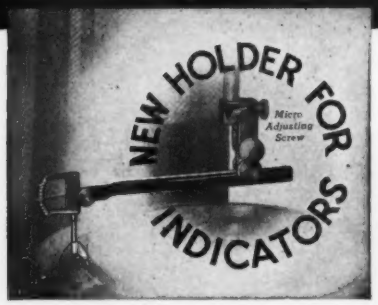
Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.

Send for Descriptive Bulletin giving full information.

The James COULTER Machine Co.
BRIDGEPORT · CONNECTICUT · U.S.A.

Save 60% TIME spent adjusting indicators



For Jigborers, Boring Mills, Milling Machines. It fits all popular indicators. The above illustration shown complete with extension bar.

NO more tiresome tapping your indicator into position. Now—after locking to approximate position, you obtain final setting by simply turning Micro Adjusting Screw. This exclusive, time-saving feature of the OSLUND HOLDER for all popular indicators gives you ***complete control.*** Write today for details.

ANOTHER TIME-SAVER

This Holder produced by makers of Oslund Indicators—the shockproof, constantly accurate indicator, whose 360° dial is read from *all* sides. Write Oslund today.

Oslund TOOL & DIE CO.
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PERFECTION IN MEASUREMENT MEANS PERFECTION IN YOUR PRODUCT

ATOMETRIC PRECISION GAGE LABORATORIES, Inc.
STAMFORD, CONNECTICUT, U. S. A.

DAVIS KEYSEATER

This low cost machine will handle any keyseating job in the shop up to 1¼ in.

Write for illustrated bulletin

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

LUERS

Patented Cutting Off Tool Holders
Patented Cutting Off Blades
ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips—MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By
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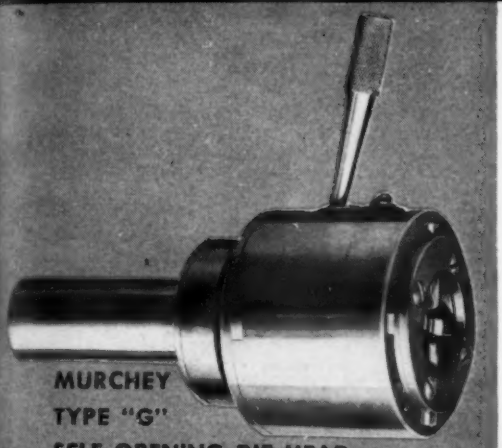
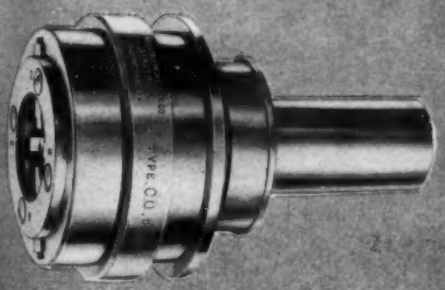
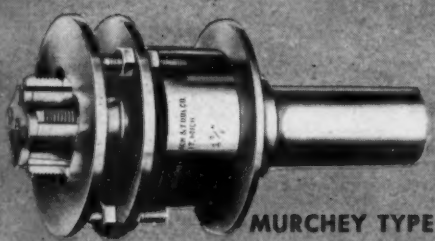


MURCHEY
TYPE "G"
SELF-OPENING DIE HEAD
(NON-ROTATING)



MURCHEY TYPE "CO"
SELF-OPENING DIE HEAD
(ROTATING)



MURCHEY TYPE "BM"
COLLAPSIBLE MACHINE TAP
(ROTATING OR NON-ROTATING)

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Murchey is now in position to quote prompt deliveries on Threading Tools and Threading Machines which can be depended on for speed, accuracy and stamina.

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Thread Milling Machines, Shell Tapping Machines, and Roller Pipe Cutting Off Machines, all types of Die Heads and Collapsible Taps.

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The Book of the YEAR!

VICTORY SCREW THREAD
DATA BOOK
With
Foreign and Domestic
THREAD SYSTEMS

CONTENTS

Definitions * Thread Series * Fits (Description) * Marking Symbols * Stockable Chaser Sizes * Coarse Thread Series—Basic Dimensions * Proposed National Extra Fine Thread Series * 27 Pitch Lighting Fixture and Brass Tubing Threads * Fine Thread Series—Basic Dimensions * Tolerances for Screws and Nuts Class 2 and 3 * 8, 12 and 16 Pitch Series * Class 2 Tolerances for Coarse and Fine Thread Series for Screws and Tapped Holes * Tap Drill Sizes for National Coarse and Fine Threads * American National Pipe Threads—Straight Pipe Threads * Acme Threads * Stub Acme * SAE Fuel, Oil and Tube Fitting Thread * Stub 60° Thread * Spark Plug Thread Sizes. British Standard Whitworth * British Standard Fine Thread * British Association Thread * Cycle Engineers Institute Thread * British Standard Pipe—Taper and Straight * International Metric Thread * French Standard Metric Thread * French Standard Thread * Lowenherz Thread—Decimal Inch Equivalent of Millimeters * Equivalent of Metric Pitches in Inches and Threads Per Inch * Three Wire System of Measuring Threads * Decimal Equivalents * Single and Double Depths of American National Whitworth and V Threads Compared * Cutting Speeds—Surface Feet * Weight of Bar Stock Per Foot * Guide for the Design and Purchase of Screw Machine Products * SAE Steels (Analysis) * Comparison of British and American Nickel Alloy Steels.

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who request it on a business letterhead;
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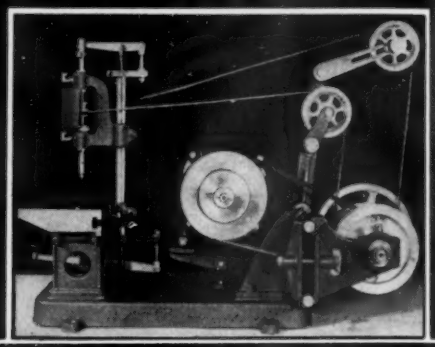
L & D
Super Sensitive DRILL PRESS
—UP TO 23,000 R. P. M.

The Lord and Davis Super Sensitive Drill Press is designed for drilling holes from .004" to 1/16" in diameter. Proper cutting speeds are obtained by running the spindle at any of eight standard speeds from 3,000 to 23,000 R.P.M.

Finger-tip control, plus precision, balanced construction, allows heavy feeds and extreme accuracy with a minimum of drill breakage.

Machines are available with one, two, three or four spindles. Write for folder.



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634 COMMONWEALTH AVE., NEWTON CENTRE, MASS.
BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS — L & D HIGH SPEED DRILL PRESSES

STAMINA is Vital

Rely on Abbott Bearing Balls to contribute to and safeguard the dependability expected of YOUR OWN products.
Keep 'em rolling!

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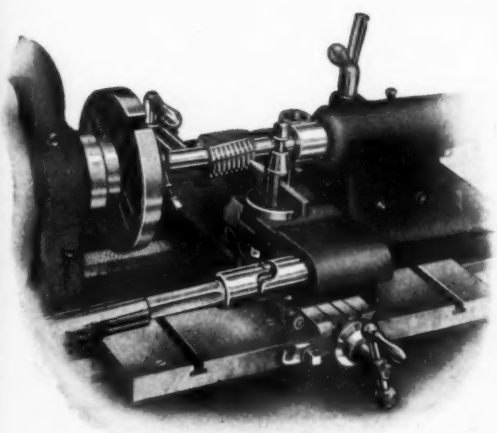
THE ABBOTT BALL COMPANY HARTFORD, CONN. U.S.A.

HENDEY

TYPE C RELIEVING ATTACHMENT

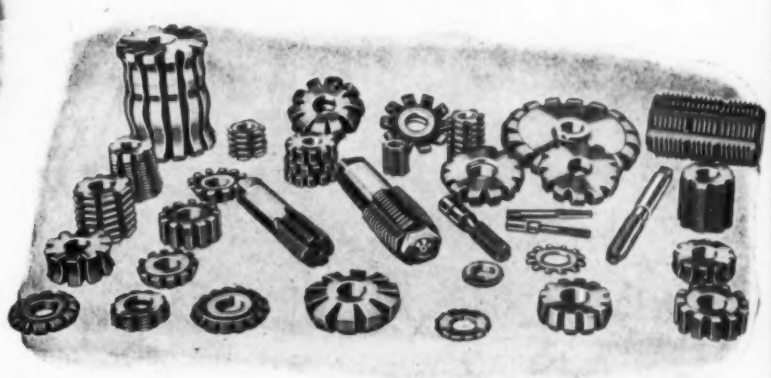
IN ITS COMPONENT PARTS.



This Hendey Type C Relieving Attachment is a noteworthy addition to the equipment of hundreds of Hendey Lathes now producing for the good of the Armed Forces.

The Attachment on a Hendey Lathe, relieving the teeth of a hob with spiral flutes.

Below is a group of formed cutters and taps which have had tooth profile relieving done with the Hendey Type C Relieving Attachment.



THE HENDEY MACHINE COMPANY

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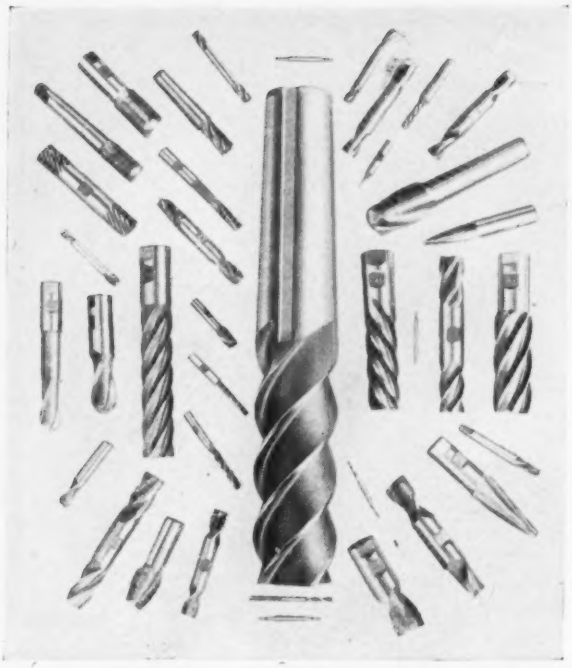

A Quarter Century's Experience Teaches:

"When you think of END MILLS

Large or Small
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Always think of

WELDON"

1918...*The first WELDON catalog offered 3 styles of END MILLS in 33 sizes.*

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MOREY VERTICAL SHAPERS

SELF-CONTAINED MOTOR DRIVE

8" STROKE
12" STROKE
14" STROKE

Precision . . . Easily handled — your operators will appreciate it . . . **Cutting Stroke** changed quickly . . . **Feeds** varied instantly . . . **Power** rapid traverse in all directions . . . **Brake** for ram automatically applied . . . **Bijur Lubrication** . . . **Timken Bearings**—Bull gear mounted on Timken Bearings. Roller table mounted on Timken Bearings . . . **Modern Design**—built to the highest standards of workmanship and materials—simplified operation, powerful yet finger-tip control

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SMITH & MILLS
CRANK SHAPERS

sizes 12" to 32" stroke

THE SMITH & MILLS CO. Cincinnati, Ohio

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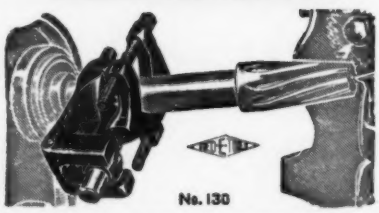
NO LOST MOTION

when indexing work held between centers on a universal milling machine.

Sliding ball and socket universal joint eliminates binding or cramping and assures accurate spacing.



No. 130

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Ivanistan and R. R. Aves.
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BROACH & GAGE COMPANY

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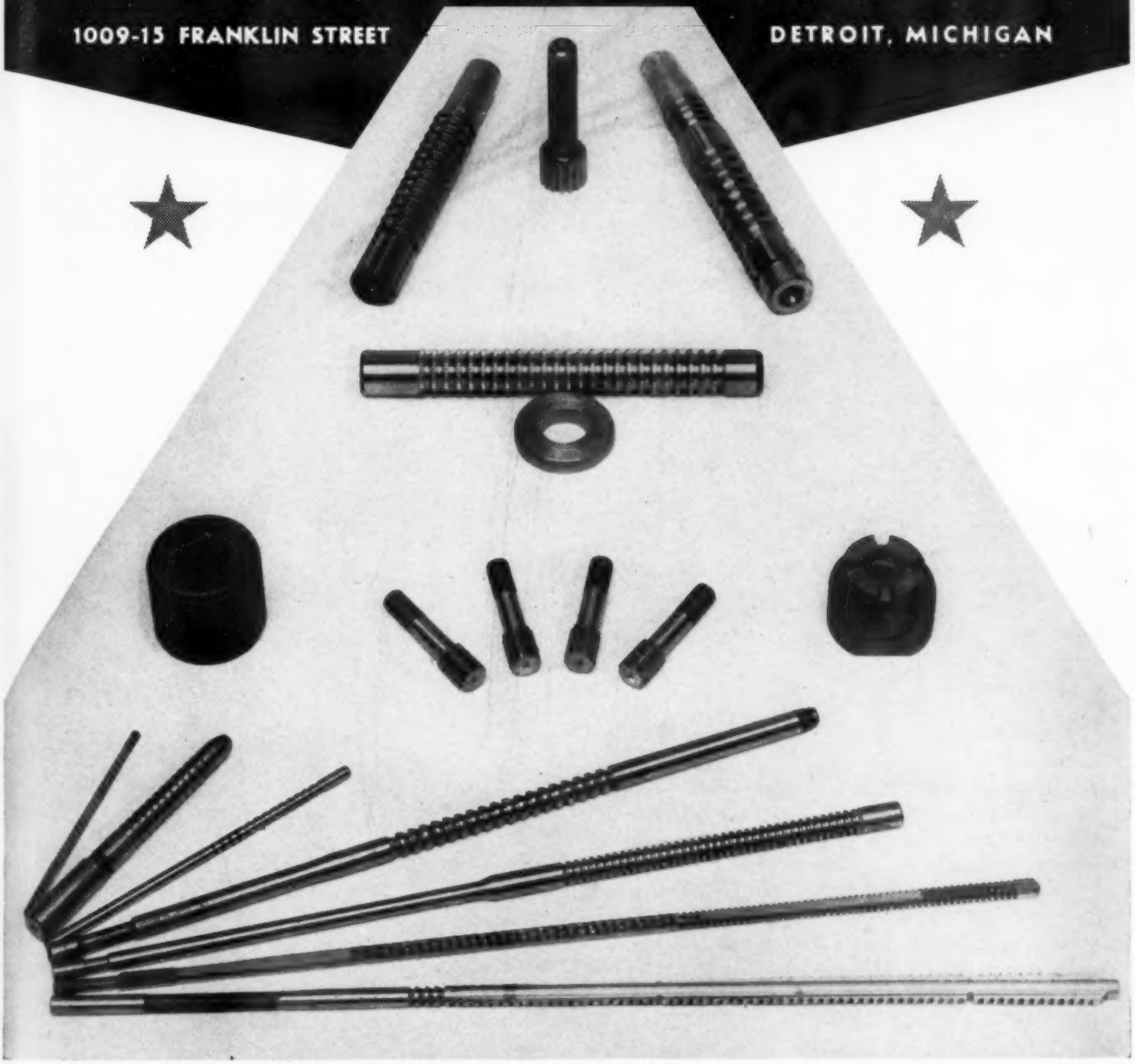

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X-Ray, Inc., our new associate company specializing in Metallurgical Radiography, now also under operation.

BEHIND OUR BOYS FOR VICTORY

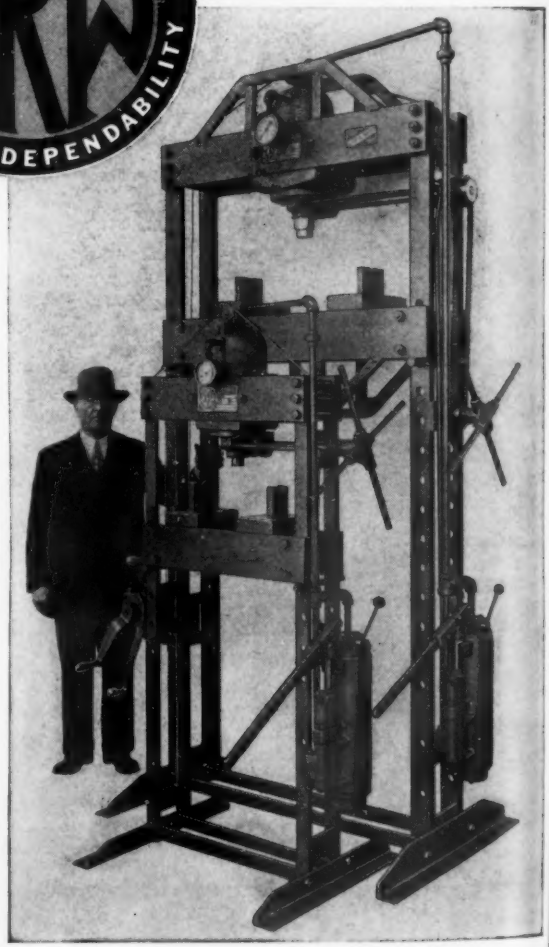
KRW HYDRAULIC ARBOR PRESSES

Engineered for War Production

★ ★

SINCE 1916 KRW A MARK OF DEPENDABILITY

Illustration below shows a special extra high 75-ton KRW Hydraulic Arbor Press in comparison with the standard 25-ton unit.



With standard KRW Hydraulic Arbor Presses as a work-proven basis, we have been able to speedily design and build many special presses for war production—without time-consuming engineering delays. The net result has been a greatly accelerated production of vital equipment which is helping to speed the day of Victory.

As an example: the large illustration shows a special, 4-man operated, air-oil press which is used extensively for bomb loading. Hundreds of these units are now in operation.

KRW also builds standard Hydraulic Arbor Presses in 25, 50 and 75-ton capacities in addition to bench-type Arbor Presses in 1/2, 1 and 3 ton capacities. If you have a problem that an arbor press might solve, talk to us. The facts concerning many successfully-solved production applications are available in our files.

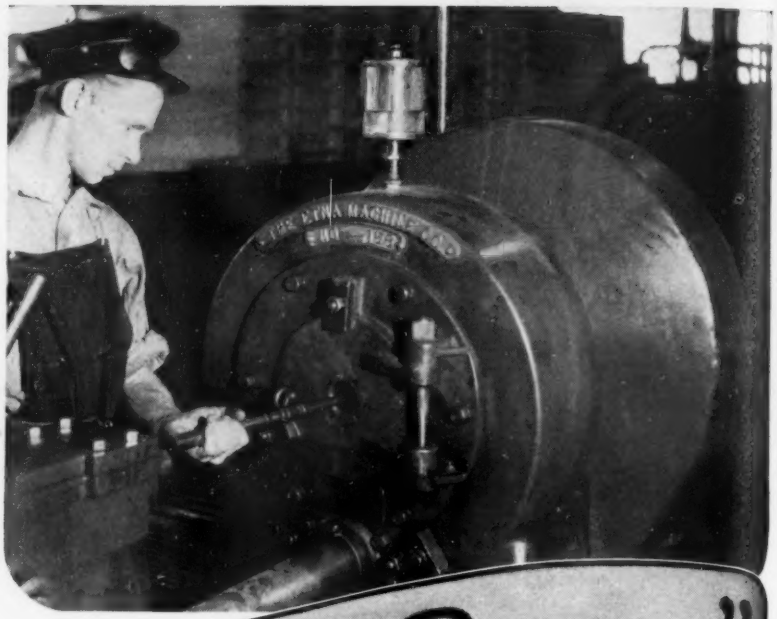
K. R. WILSON
10 LOCK ST., BUFFALO, N. Y.

The wide and well-graduated range of Niagara Power Squaring Shears offers the most productive machines for the many requirements of war plants. They cut sheared edges and narrow strips straight to within a few thousandths of an inch. They are arranged for convenient operation to speed up squaring and trimming. Niagara Machine & Tool Works, Buffalo, N. Y. District Offices: Detroit, Cleveland, New York.

Shear knives available for cutting alloy and special steels. Let us know what you desire to cut. Prompt delivery on spare knives for Niagara Squaring Shears. Also factory re-grinding service by the same skilled men who grind new Niagara knives.

BUY UNITED STATES WAR BONDS AND STAMPS

IF IT'S A QUESTION OF TAPERING, SIZING OR REDUCING OF ROUND SOLIDS OR TUBING



...Large or Small

"Ask ETNA about Swaging"

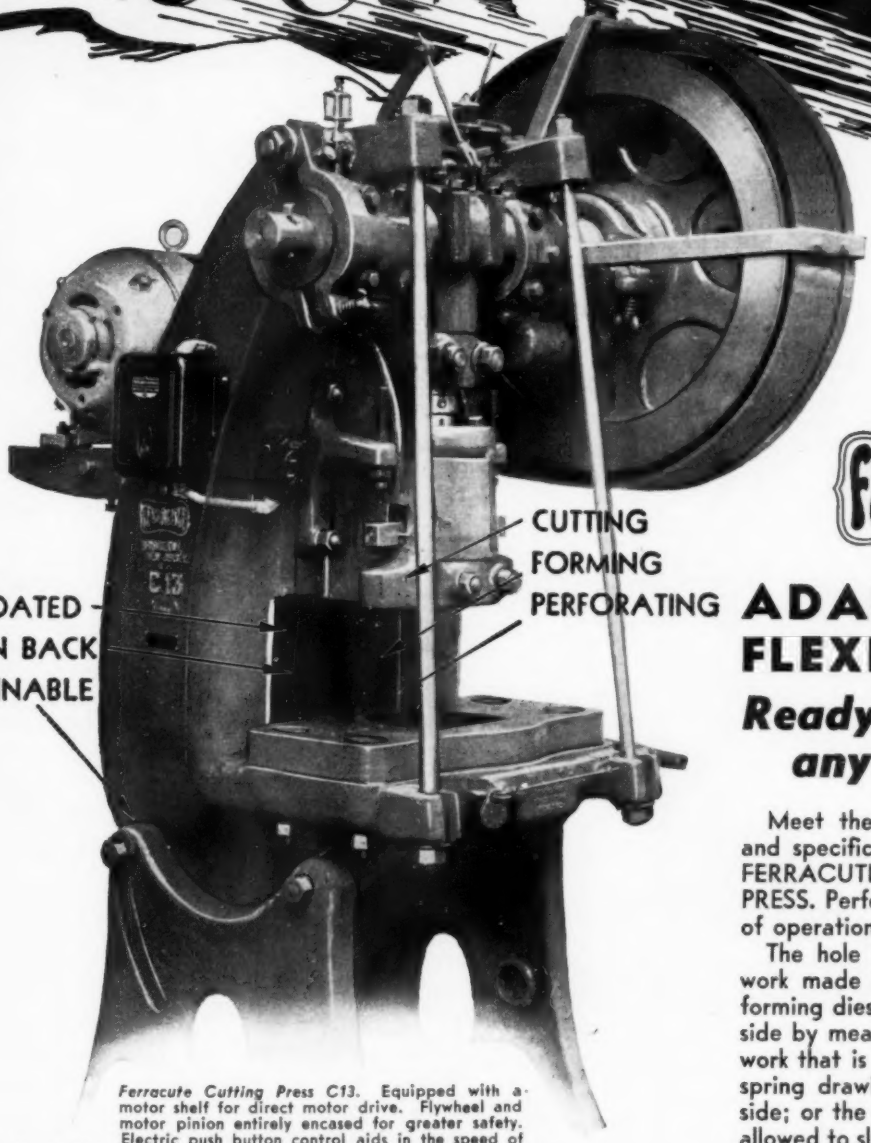
• Here are two jobs upon which ETNA SWAGING MACHINES are being actively employed today. These two examples show clearly the wide range of work that ETNAS are doing — and can do for you. Today, when all-out speed is needed to meet urgent war needs, Swaging is important. You can often eliminate machining operations . . . improve quality —increase output by Swaging with ETNAS.

Swaging Machines by ETNA are built in standard sizes with die lengths up to 18" and diameters up to 8". Larger units are built to your order. Write, wire or phone for details today!

THE ETNA MACHINE COMPANY
TOLEDO, OHIO

"JEEP" OF PRODUCTION

FERRACUTE *General Purpose* CUTTING PRESS



Ferracute Cutting Press C13. Equipped with a motor shelf for direct motor drive. Flywheel and motor pinion entirely encased for greater safety. Electric push button control aids in the speed of operation. In addition to the hereditary Ferracute heavy frame, this press is equipped with stay rods to attain the maximum in rigidity.

TRADE FERRACUTE MARK

ADAPTABLE AND FLEXIBLE

Ready for any job any time--anywhere

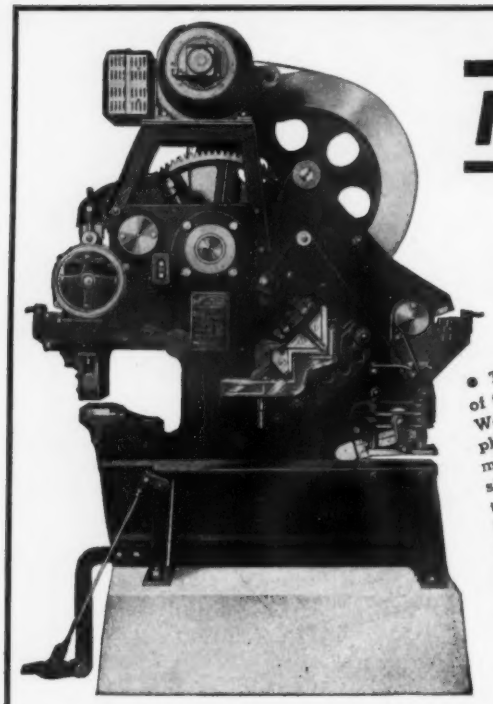
Meet the problems of changing design and specifications with the flexibility of the FERRACUTE General Purpose CUTTING PRESS. Perfectly adaptable to a wide range of operations on sheet metal.

The hole in the bed of the press allows work made in "cutting" or "push-through" forming dies to drop through or pass to one side by means of a chute. Cut and formed work that is "knocked-up" in combination or spring drawing dies may be pushed to one side; or the press may be inclined and work allowed to slide by gravity through the opening in the throat.

FERRACUTE MACHINE COMPANY

Presses and Press Brakes

BRIDGETON, NEW JERSEY, U. S. A.



MAKING Every SECOND COUNT MORE

• The speed and versatility of the Buffalo Universal Iron Worker is little short of phenomenal! This husky metal-working tool, with simple controls, can be put to work on practically all kinds of stock—such as angles, tees, channels, I-beams, rounds, squares, flats and plates. It assures rapid, accurate punching, shearing, slitting, coping or notching. Here's a production tool that makes every second count more—plenty more!—in Industry's urgent war effort.

BUFFALO FORGE COMPANY

448 Broadway Buffalo, N. Y.

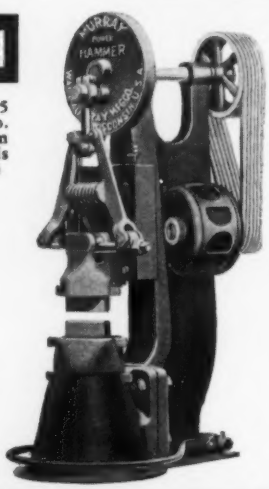
Branch Engineering Offices in Principal Cities
Canadian Blower and Forge Co. Ltd., Kitchener, Ont.

The Army-Navy Production Award — "for exceptional achievement in war production."

"Buffalo" UNIVERSAL IRON WORKER

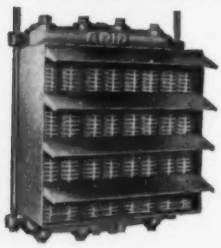
POWER DRIVEN FORGE HAMMERS

Made in 5 sizes — 25 lb. to 500 lb. ram (shown here is 250 lb. ram)



Adaptable to wide range of work —light or heavy. Adjustable for different thicknesses of dies and materials. Extremely powerful, yet flexible in operation. Can be operated under perfect control, and with very little effort; ram design is a special feature. Hammers have no shield passing in front of ram to obscure proper vision of work.

GRID UNIT HEATER



Cast iron takes the place of aluminum for the heating sections, to cooperate with the war effort in using substitute materials—but it's still the ultimate in unit heater quality. The new Grid is engineered along the same line as the Grid Unit which had aluminum heating sections—dependable, long life unit. Patent applied for. No corrosion—no leaks or breakdowns. Engineered and constructed to withstand up to 250 lb. steam pressure. Engineering data and capacity tables upon request.

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Wausau, Wisconsin

Manufacturers since 1883

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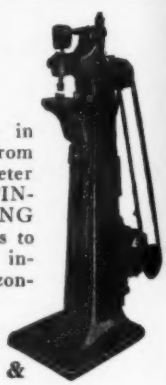
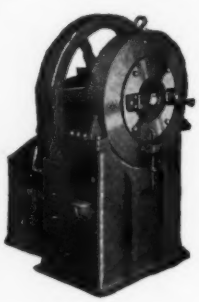


RIVETERS—PIONEERS in their line—head rivets from smallest to 5/8" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.

85 Sillman Ave., Bridgeport, Conn., U. S. A.



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TORRINGTON
ROTARY
SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

The Torrington Co., Swager Dept.

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EARS FOR THE ARMY

ROTARY switches, used extensively in the radios of our armed forces, are speeded to completion at P. R. Mallory and Co., with the help of Federal Presses. By staking the terminals of a switch section on a 12-station Federal Dial Feed Press, assembly time is reduced substantially, and a possible bottleneck is avoided.

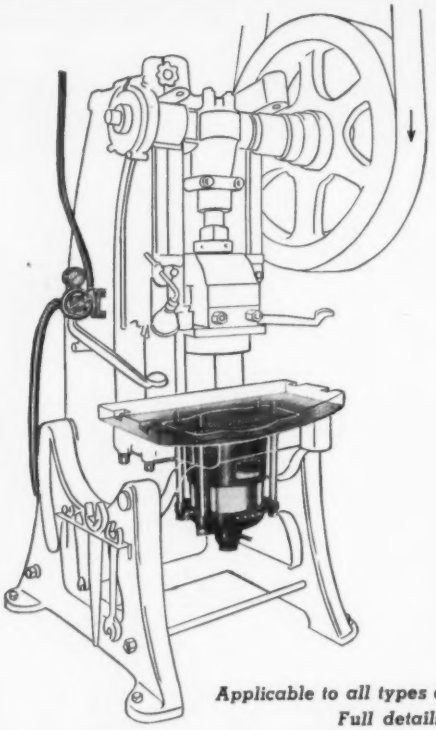
Federal Presses are performing many highly specialized jobs in hundreds of plants throughout America to speed sorely needed war equipment. Primary, secondary, and assembly operations are accomplished quickly, safely, and precisely, often eliminating the need for specialized machinery of limited utility. Write for help with your press problems.

Special Applications

Federal Open-Back, Inclinable Presses may be equipped with automatic feed and ejector mechanisms, and automatic stops. Standard models of either geared or flywheel type are available in 9 sizes with capacities from 6 to 80 tons, with or without dial feeds.

FEDERAL
DIAL FEED
PRESSES

THE FEDERAL PRESS CO., 302 DIVISION STREET, ELKHART, INDIANA



11 REASONS *why it will* PAY YOU *to equip your* PUNCH PRESS *with the NEW IMPROVED DAYTON ROGERS Universal Pneumatic* DIE CUSHION

1—This self-contained unit is quickly and easily installed on any punch press.
2—Can be applied to advantage on dies already in use in place of springs or rubbers.
3—Relieves excessive strain on metal draw, leaving normal metal strength on finished work.
4—Adaptable to all deep drawing, compound blanking forming and piercing work.
5—Leader pin is fully guided, die cushions rigidly mounted, *eliminating pin pressure pad deflection.*
6—Adaptable for all knock out, ejector and die pressure pad actions.
7—Practical and economical for long or short runs.
8—Large pin pressure area possible. (Use of all press bed opening).
9—Easily lubricated, centralized lubrication system (from front of cushion).
10—Leader pin runs in "Oilite" bearing and requires no other lubrication.
11—Moderately priced, accurately built, simple in design.

Applicable to all types of dies and punch presses.
Full details on request

DAYTON ROGERS MFG. CO.
MINNEAPOLIS, MINN.

THIS PORTER-McLEOD CUTTING OFF MACHINE *PAYS FOR ITSELF* IN STEPPED-UP PRODUCTION

If your cold metal sawing involves cutting stock from 3 inches up, here's the machine to put such operations on a production basis.

This new Porter-McLeod 8" machine is particularly advantageous on larger sizes of stock. *By supporting the blade close up to the* rim of the blade and *pulling* the blade through the cut, buckling of the saw is prevented and accuracy maintained.

The standard feed of this machine is 3 inches a minute but can be stepped up for cutting brass and non-ferrous metals.

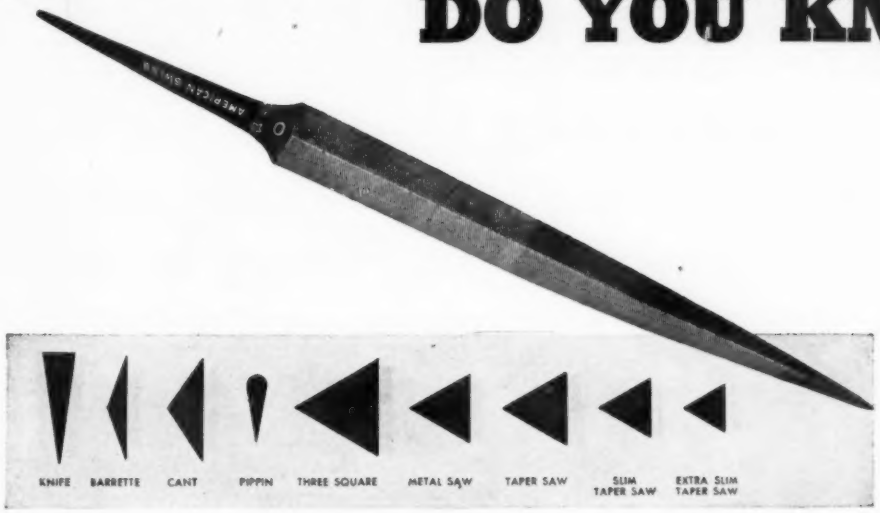
Because of the great leverage exerted on the blade through the Porter-McLeod Pull Method of Drive and the support at the rim of the blade, this machine requires less power and assures a straight cut. Multiple units can be cut at one time on the Porter-McLeod by means of the upper feed of the machine which permits nesting of bars.

Explore the great time and money-saving possibilities offered by this modern production cutting off machine. Investigate *NOW* by sending for complete details.

PORTER-McLEOD MACHINE TOOL CO., INC.
HATFIELD, MASS., U. S. A.

MACHINE TOOL COMPANY

HOW MANY *Triangular Files* DO YOU KNOW?



The "American Swiss" line of Swiss-Pattern Files includes nine different shapes of triangular files . . . each designed for specific kinds of precision filing work. For example, the long narrow wedge shape of the Knife File is for filing acute angles, and the delicate proportions of the Metal Saw File enable that type to work in particularly small holes and spaces.

For 40 years these files, like all "American Swiss" products, have been popular with file users because of their uniform hardness, clean sharp teeth, and long wearing qualities that assure better work in less time and at less cost. Today, these "American Swiss" File qualities are helping ordnance plants and machinery builders all over the country do their share in the National war effort.

Buy From Our Distributor

AMERICAN SWISS FILE & TOOL CO., ELIZABETH, N. J.

ASK FOR THEM BY NAME

American Swiss

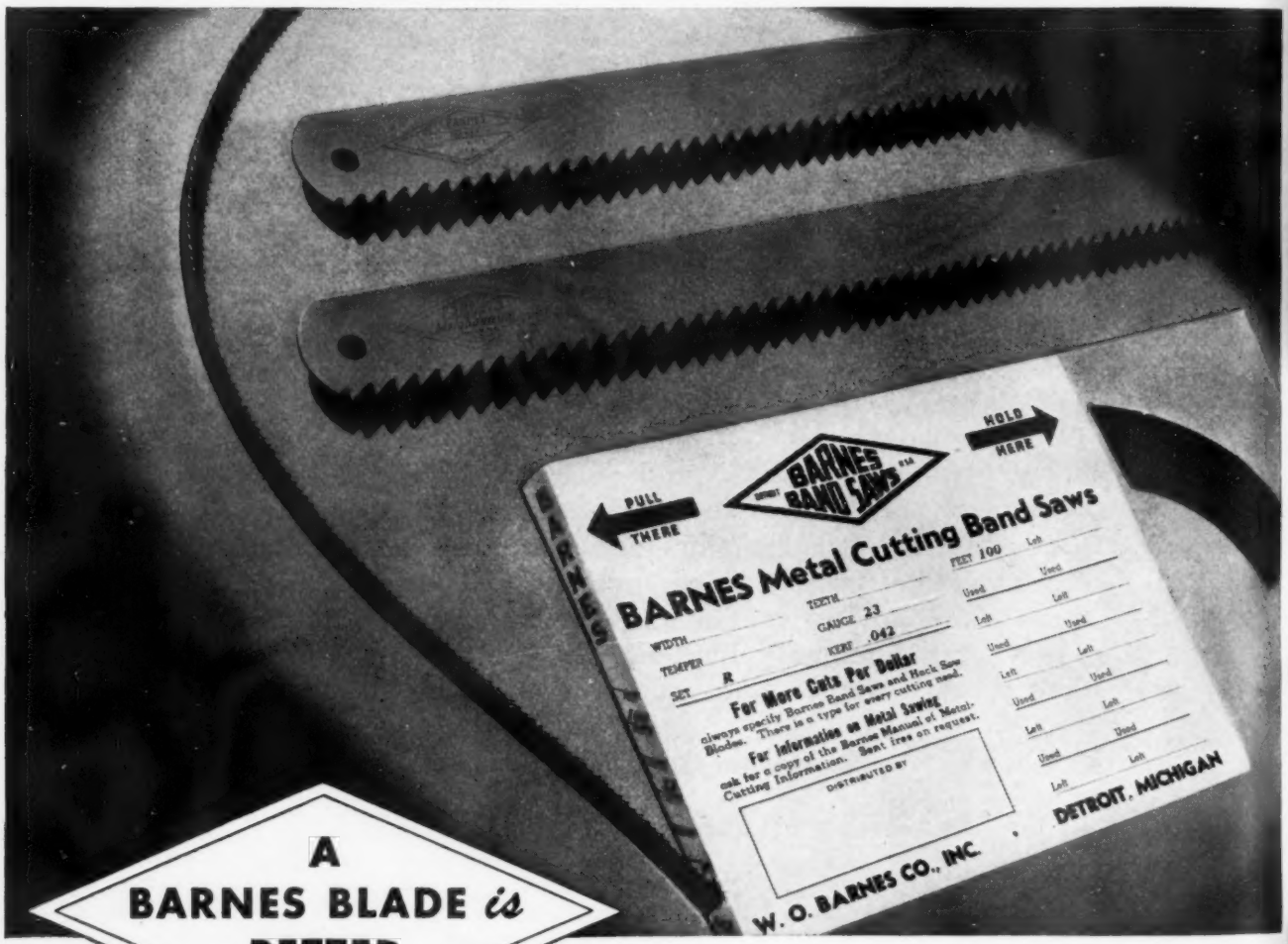
ONLY THE BEST

SWISS PATTERN FILES

BARNES *means* UNIFORMITY

• Uniformity of the Barnes blade is established by modern manufacturing methods — guarded by careful inspection. . . Insist on Barnes for maximum production. Order from your Mill Supplies Distributor.

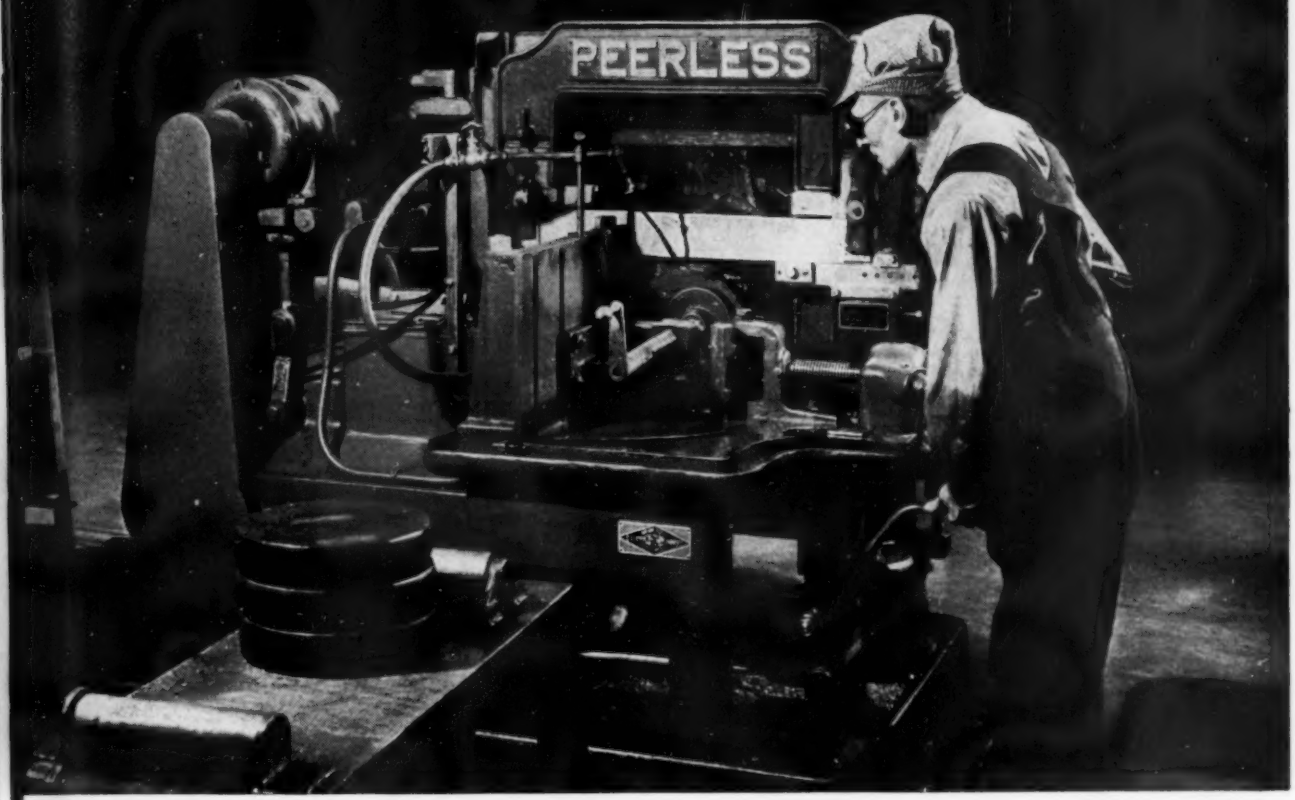
See our Exhibit at the A. S. T. E. show at Milwaukee, Booth 59


PULL THERE
BARNES BAND SAWS
HOLD HERE
BARNES Metal Cutting Band Saws
WIDTH
TEETH
GAUGE .23
KERF .042
TEMPER
SET R
FEET 100
For More Cuts Per Dollar
always specify Barnes Band Saws and Hack Saw Blades. There is a type for every cutting need.
For Information on Metal Sawing
ask for a copy of the Barnes Manual of Metal-Cutting Information. Sent free on request.
DISTRIBUTED BY
W. O. BARNES CO., INC.
DETROIT, MICHIGAN

A BARNES BLADE *is* BETTER

W. O. BARNES CO. INC.
DETROIT MICHIGAN

PEERLESS SAWS THE HUB FROM A HUGE CONNECTING ROD



ACCURATE FAST SAWING SAVES MACHINING AND MANPOWER

The Peerless 14 x 14 High Duty Metal Cutting Saw, shown in action in the picture, brings to the big sawing jobs the same speed and accuracy which have won widespread favor for smaller Peerless High Duty Types.

Peerless accuracy often influences the entire production of a shop. It not only saves time and metal in sawing, but it's full, automatic cycle also releases manpower for other departmental duties, saves tying up expensive machining equipment and skilled manpower. The close tolerance cutting of Peerless Saws speeds up over-all output.

The Peerless *FOUR-SIDED SAW-FRAME* eliminates side play — insuring accuracy and reducing metal waste to a minimum. As little as 1/16" is removed. The *BACKING-PLATE BLADE-SUPPORT* permits application of maximum feed pressure without causing undue blade wear. Hydraulically controlled automatic length gauging accurately sets the length of the cut and reduces stub-end waste.

Peerless combines maximum speed, accuracy and safety with minimum waste of metals. Mail the coupon below for cutting time estimates which may prove the means of increasing your production.

PEERLESS MACHINE COMPANY
1600 JUNCTION AVENUE • RACINE, WISCONSIN

PEERLESS MACHINE COMPANY, Dept. M-443, Racine, Wis.
Mail cutting time estimate for.....

☐ Mail catalog on Hydraulic type Saw for High Production Cutting
☐ Mail catalog covering Vertical type used for Die Block Work
☐ Mail catalog on Mechanical type Saw for production cutting
☐ Mail catalog on general utility and maintenance Saws

Company.....
Individual.....
Street.....
City..... State.....

Peerless
THE ONLY METAL CUTTING SAW
WITH FOUR-SIDED SAW-FRAME AND BACKING-PLATE

Fast ACCURATE Sawing DEMANDS PEERLESS BLADE CONTROL

NO FIFTH COLUMN
VICTOR
HACK SAWS

ALL STEEL TONNAGE IS ESSENTIAL TO THE WAR EFFORT

A RATING ON AN ORDER IS ITS SERVICE STRIPE

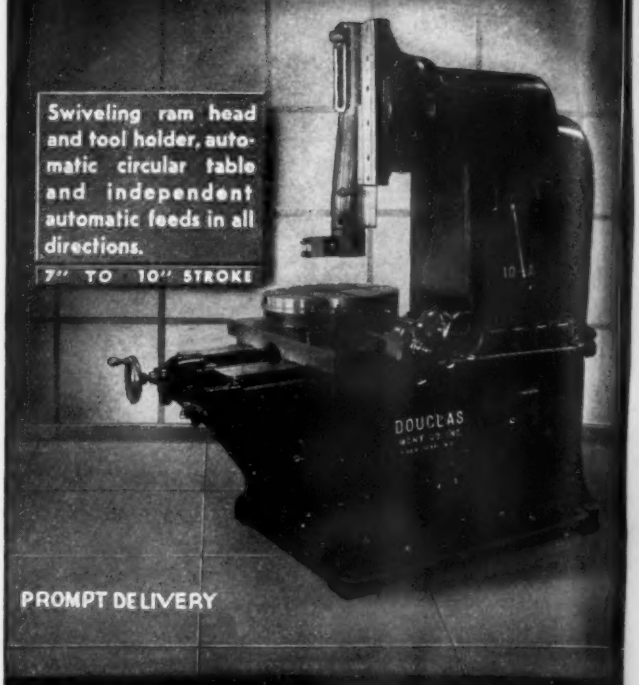
Comply with government regulations and insure the delivery of your order. Specify the blade with the VICTOR Name.

VICTOR SAW WORKS, INC.
MIDDLETOWN • NEW YORK

T. M. Reg. – Blades bearing the name "Moly" are made only by Victor Saw Works, Inc. and affiliated companies.

3744B

DOUGLAS PRECISION SLOTTER


Swiveling ram head and tool holder, automatic circular table and independent automatic feeds in all directions.
7" TO 10" STROKE
DOUGLAS
PROMPT DELIVERY

DOUGLAS MACHINERY CO. INC.
150 BROADWAY NEW YORK, N. Y.

BAUMBACH
STANDARDIZED DIE SETS

BETTER-MADE
DIE SETS
AT LOWER COST

46 Styles—195,000 Sizes

E. A. BAUMBACH MFG. CO.
Machined Steel Drop Forged Steel Semi-Steel
Send for our new catalog
1812 South Kilbourn Ave., Chicago, Ill.

EVERY-ISSUE "WHERE-TO-BUY" SECTION DISCONTINUED

This step is necessary to conserve paper, in compliance with WPB's restriction. Still available, however, is *American Machinist's* enlarged "Where-To-Buy" Directory, as published in the Jan. 21, 1943, "Annual." Reprints of this Metal-Working reference source may be obtained at no charge by writing READER SERVICE DEPT., AMERICAN MACHINIST, 330 W. 42 St., NEW YORK, N. Y.

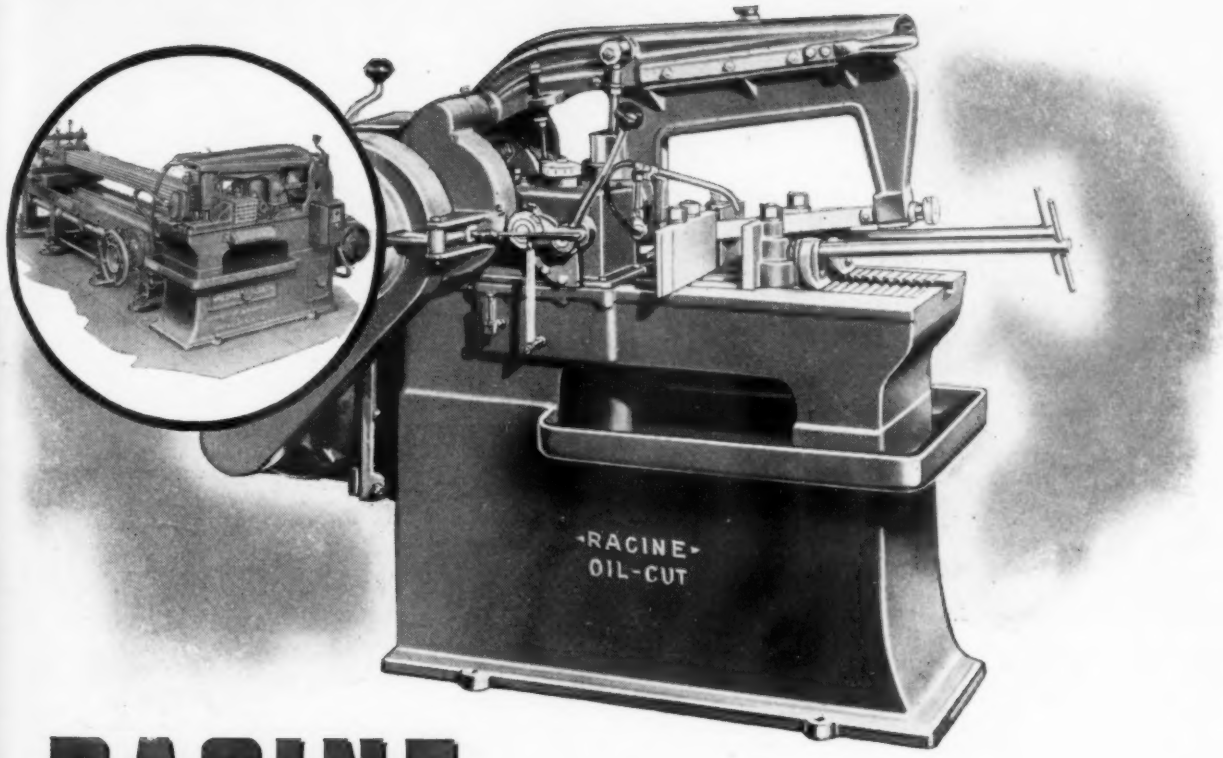
TO INSTRUCT NEW MEN IN THE HANDLING OF DIAMOND TOOLS

we will send you a valuable booklet. No charge, no obligation.

KOEBEL DIAMOND TOOL CO.
9345 Grinnell Ave., Detroit

KOEBELITE DIAMOND TOOL

Multi-Point, Multi-Set, Multi-Edge, and Single Set. Diamonds for all Industrial Purposes.



RACINE METAL CUTTING MACHINES

THE PRODUCTION SAWS OF MODERN INDUSTRY

Operation No. 1 in Your Metal Cutting Department

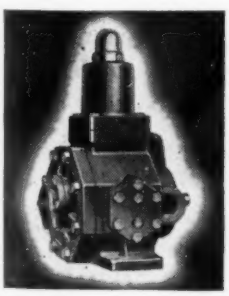
Start your production line with Racine accuracy—in the cutting of bars, tubing, and structural shapes.

This dependable accuracy is the result of Racine's rigid construction features and the Racine type of self-compensating, flexible hydraulic feed.

Racine was first to successfully apply the smooth oil-cushioned operation of hydraulic action to a power hack saw machine. Simple automatic hydraulic control of feed and pressure make Racine preferred by the inexperienced operators as well as the experienced operators in today's high speed war production. A single lever controls feed, clutch, transverse and neutral operating action—all from one operating position.

And Racine's extra heavy pivot shaft and wide pivot bearing in saw guide arm, prevents cocking or binding strain—greatly lengthening the life of the machine.

Investigate Racine's wide range of sizes—capacities 6″ x 6″ to 20″ x 20″. Racine Automatic Hydraulic Stock Feed Machines—that bring new labor-saving features to any metal cutting operation—are also available.

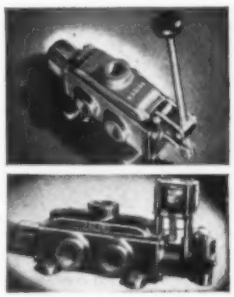


RACINE *Variable Volume*
HYDRAULIC PUMPS
A Modern Source of Hydraulic Force

A new "high" in vibrationless action is made possible by Racine Oil Hydraulic Pumps for any operation of feeding, bending, forming, holding or molding. Only Racine has the "Vane Type" Variable Volume feature—no relief valves are required. It pumps only the required amount of oil needed to do the job. Pressures from 50 to 1000 lbs. per sq. in. at 0 to 30 gal. per min.

RACINE
OIL HYDRAULIC VALVES

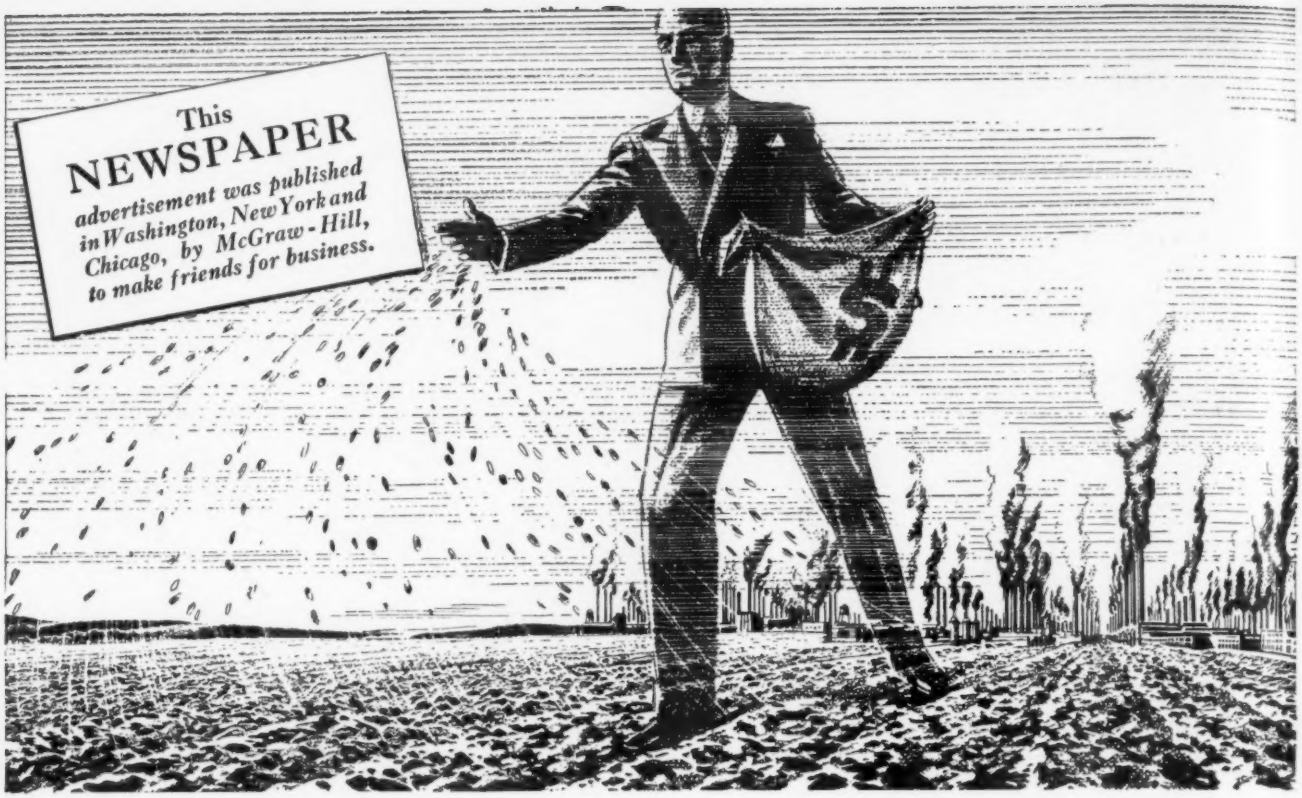
The exclusive Racine "Sleeve Type" and "Balanced Piston" construction provides larger bearing and sealing area. Piston cannot sag. Shock is reduced to a minimum in hydraulic circuit, because of Racine's unique "porting" design. These four-way valves are available with stem, lever, roller, latch, foot treadle and solenoid operating devices. Made in ⅜″ to 1½″ standard pipe sizes. "Custom-made" porting arrangements can be supplied to suit your specific requirements.



Racine's Hydraulic specialists will be glad to help you with your hydraulic application problem—with no obligation. Immediate attention will be given your request for complete information and prices on Racine Saws or Hydraulic Pumps and Valves. Address Dept. AM-S

STANDARD FOR QUALITY AND PRECISION · RACINE · RACINE TOOL and MACHINE CO.

RACINE TOOL and MACHINE COMPANY
STANDARD FOR QUALITY AND PRECISION
RACINE, WISCONSIN • U. S. A.



Where do jobs come from?

SOMEDAY 10 million fighters, 2 million government workers and 10 or 15 million war workers are going to be asking: "Where can I find a JOB?"

The best answer will be a job for every questioner.

► The first step toward creating more jobs after the war should be to make sure that business has enough "Seed Money"* left over after taxes to grow a better crop of products and markets.

We have published some advertisements urging that the excess profits tax law be amended to let business keep enough of its "Seed Money" to convert its plants and start things rolling after the war.

► A proof of one of these "Seed Money" advertisements was sent to a man who lives up in Lowell, Mass. In reply, he wrote from his own experience such a good example of the way in which "Seed Money" creates jobs that we want you to have a chance to read it. Here it is:

Reprints of this advertisement are available in handy booklet form.

Where do jobs come from? (*Cont'd*)

December 23, 1942

Mr. James H. McGraw, Jr.
McGraw-Hill Building
330 West 42nd Street
New York, N. Y.

Dear Mr. McGraw:

Your esteemed favor of December 11 was duly received and contents noted carefully.

I can truly say that my business is completely a development of "Seed Money" and "Profit." I started a commission Wool and Noils carbonizing business in Woonsocket, Rhode Island in July 1909, with three men and one boy for the payment of whose three days' work the first week, I had to borrow $35.00 from a friend, because I had not earned one penny for six weeks before I undertook to go in business for myself. I had to operate without any financial assistance but with ample moral credit and a very favorable reputation built up at my business in working for other mills.

In two years' time I put back in the plant I was hiring a good part of my profits and what I had left I invested in a plant in Lowell and incorporated a company where I started in the Wool and Noils carbonizing with 13 employees with a payroll of $300.00 in January 1912.

Since then, practically all profits were ploughed back into the business gradually in new, modern machines and since two years have the largest wool scouring machine in the world, built by our men in our plant, employing now from 225 to 250 men, with a payroll which some weeks exceeds $10,000.00.

I have raised a family of two boys and two girls. The boys are now my associates. We own the business outright, no outsiders, also two of the 15 buildings we occupy.

Of course, I cannot say that I have made a fortune, for, all I possess is in plant and machinery, but, for all these years my business has been pretty steady. I have paid wages and salaries to many people and all that out of "Seed Money" and "Profit." For many years I had a very hard, at times very discouraging struggle because of lack of working capital but I persevered, operating very economically and cautiously.

I founded the business which my two sons will continue and I hope successfully and moderately profitable.

I trust that others will write you similarly so that you will have plenty of facts and materials to carry on your campaign of education of the public.

With heartiest, best wishes of the season, I am

Sincerely yours,

JG:MNL James Gilet

• • •

Doesn't that letter make it clear that reinvested profit is the source of new jobs?

► Under the present excess profits law, very little "Seed Money" can be saved for reinvestment after the war.

Isn't it about time for post-war planning to get down to the simple facts of good living?

► Men like James Gilet can keep this country at work, if legislators will make up their minds that good business is the source of all good living.

The mail that Congressmen get is their best contact with the people they represent. Write your Congressman and ask him to help in adjusting the law that takes away the "Seed Money" of business, and to review all laws with this principle in mind:

"What's Good for Business is Good for Americans"

THE McGRAW-HILL NETWORK OF INDUSTRIAL COMMUNICATION

22 publications, which gather "war-news" from the "war-production-front" through a staff of 153 editors and 725 engineer-correspondents . . . More than 1,500,000 executives, designers, production men and distributors use the editorial and advertising pages of these magazines to exchange ideas on war-production problems.

McGRAW-HILL BOOKS

Publishers of technical, engineering and business books for colleges, schools, and for business and industrial use.

*"Seed Money" is that part of profit which is held for reinvestment in a business to insure its growth.

McGRAW-HILL

PUBLISHING COMPANY, INC. . . . BOOK COMPANY, INC.

330 WEST 42ND STREET, NEW YORK

THE McGRAW-HILL NETWORK OF INDUSTRIAL COMMUNICATION:

American Machinist • Aviation • Bus Transportation • Business Week • Coal Age • Chemical & Metallurgical Engineering • Construction Methods • Electrical Contracting • Electrical Merchandising • Electrical West • Electrical World • Electronics • Engineering & Mining Journal • E. & M. J. Metal and Mineral Markets Engineering News-Record • Factory Management & Maintenance • Food Industries • Mill Supplies • Power • Product Engineering • Textile World • Wholesaler's Salesman • Affiliated with Business Publishers International Corporation, publishers of Business and Technical Magazines for Latin America, and Overseas Circulation.

SEARCHLIGHT SECTION

POSITIONS VACANT

These Positions Vacant advertisements are published subject to agreement by the advertisers not to consider applicants now employed on war work unless they obtain written release from present employer.

EXPERIENCED CUTTER GRINDER. Man of mature age preferred. Capable of teaching others and complete supervision of newly equipped cutter grinding department in small arms plant located in central New York State. In reply state age, experience, and salary expected. P-545, American Machinist, 330 W. 42nd St., New York, N. Y.

MECHANICAL DRAFTSMAN capable of designing and developing Power Industrial Truck Equipment. Permanent position with opportunity for advancement. Must be over 38 years of age and able to take charge of drawing room. P-546, American Machinist, 330 W. 42nd St., New York, N. Y.

EXPERIENCED MACHINE tool salesman, familiar with turret lathes and other machine tools for the New York District. Send detailed reply which will be held in confidence. Opportunity for the right man. P-547, American Machinist, 330 W. 42nd St., New York, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS — $2,500 to $25,000. This advertising service of 33 years recognized standing negotiates for positions of calibre indicated. Procedure individualized to your personal requirements. Retaining fee protected by refund provision. Identity covered. If salary has been $2,500 or more send for details. R. W. Bixby, Inc., 266 Delward Bldg., Buffalo, N. Y.

POSITIONS WANTED

RESEARCH AND DEVELOPMENT equipment engineer available. M. E. Graduate with 28 years of field experience embracing Product Development for chemical, petroleum, mining, food and paper industries. Would prefer a connection in Northern New Jersey or Metropolitan New York area. PW-536, American Machinist, 330 W. 42nd St., New York, N. Y.

MECHANICAL EXECUTIVE with 30 years experience as Works Manager and Superintendent. Well versed on modern methods. A1 references, available March 15. PW-538, American Machinist, 330 W. 42nd St., New York, N. Y.

EXECUTIVE ENGINEER—open for connection to develop products, processes, and tooling for present and post-war products. Accustomed to originating designs and carrying into production including development of special production-machines, plant design and organization. Contribute valuable inventions on royalty basis. Salary $12,000 or percentage of savings. Age 40. PW-540, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

GRADUATE MECHANICAL ENGINEER — American Citizen, age 45, with diversified experience here and in foreign fields as Manager, Designer, Research and Development Director. Now employed but in non-essential work. Interested in position where skill can be used to foster the war effort and at the same time build a future after the emergency. Will go any place in the United States or out of the country. PW-541, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

MANUFACTURING EXECUTIVE experienced in Automatic Screw machine and general machine shop production, purchasing and contract procurement. Familiar with general management of small plant and willing to take responsibility of department in large plant. PW-542, American Machinist, 520 N. Michigan Ave. Chicago, Ill.

GENERAL MANAGER—whose mature, profit-minded, sanely aggressive qualifications will become an immediate asset to a company with expansion, reorganization or rebuilding program. Experience includes fifteen years as General Manager of medium-size machinery, tool, foundry and related industries with results that assures ability to carry complete responsibility and develop maximum possibilities economically and profitably. PW-543, American Machinist, 330 W. 42nd St., New York, N. Y.

MATERIAL CONTROL SUPERVISOR. Twenty years experience. Forty-five years old. Have thorough knowledge of production and cost. PW-544, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

FREE BULLETIN

CATALOG No. 430—8½ x 11, 28 pages, indexed and illustrated, of new, used and rebuilt machine machine tools, metal fabricating machinery, production machinery, structural steel machinery and sheet metal machines in stock for prompt delivery. Interstate Machinery Co., Inc., 1431 W. Pershing Rd., Chicago, Ill.

Executives, Engineers, Chemists and Metallurgists!

Qualified men wanted for openings throughout the United States. Write for application, or submit experience record.

Inquiries solicited from responsible employers. All negotiations confidential. Est. 28 yrs.

HARRISON PERSONNEL SERVICE

20 W. Jackson Blvd. CHICAGO

WANTED

Shop Superintendent or Foreman

Thoroughly familiar with production methods on close precision machine parts. Prefer a man who has been plant manager or superintendent of a custom machine shop employing around three hundred men, state background and full references in first letter. We are now engaged 100 percent in War work but will resume custom manufacturing after war. This job should be particularly attractive to a capable man who has illness in family which climatic change would help. We can arrange Midwestern interview.

We also need first class tool makers, tool-up and maintenance men, turret lathe operators, precision inspectors and tool grinders, capable of operating Universal cylindrical vertical type grinders. Tool grinders should be capable of setting up machines for production, grinding milling cutters, thread milling cutters, etc.

EFG ENGINEERING WORKS, Inc.

PUEBLO, COLORADO

SHOP FOREMAN

WANTED

A small but expanding strongly financed machine shop in the middle west engaged in defense work desires to employ a man with the following qualifications to take charge of a plant with facilities to employ about thirty-five men.

The man we want must have years of experience, a good record of past employment, exacting standards as to the quality of work produced, and good business sense.

The plant is now subcontracting, principally on an hourly basis, for a number of prime contractors, and is specializing in fixtures and jigs but doing production work as well.

We will pay a good salary and a participation in the profits.

When responding, give us full details about your experience and the names of present and past employers. We will not correspond with your present employer without your permission, and our inquiries will be directed to past employers

P-548, American Machinist
520 N. Michigan Ave., Chicago, Ill.

GENERAL MANAGER

to take charge of precision aircraft parts plant and handle outside contacts, must have aircraft manufacturing experience, give full particulars in first letter which will be held strictly confidential. #211, suite 617. 1457 Broadway, N. Y. C.

SALESMAN WANTED

MECHANICAL ENGINEER for a manufacturer of precision gears. Must have long selling experience in the same line. Write full details outlining educational background, names and addresses of former employers, territory covered. Exceptional opportunity for well qualified man. SW-539, American Machinist, 330 W. 42nd St., New York, N. Y.

PATENT ATTORNEYS

PATENTS, COPYRIGHTS. Booklet, "General Information Concerning Inventions and Patents" and "Fee Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N.W., Washington, D. C.

CONTRACT WORK

WORK WANTED — For advertisements of work wanted see opposite page.

PRIME LOANS TO

CORPORATIONS—Unsecured

INDIVIDUALS—Collateralized

LARGE Sums—LOW annual rates.

COLLATERAL DISCOUNT CORP.

Graybar Bldg.—New York City

JOBBERS AND MANUFACTURERS' AGENTS WITH GOOD INDUSTRIAL CONTACTS

Our client has developed a new type of soluble cutting oil that especially fits the present requirements of war production machinery handling hard steels and special alloys, where longer tool life and generally greater efficiency is so essential.

Exclusive territories available to proven, responsible distributors or manufacturers' agents. Because our client has no Eastern Office, you are invited to address your inquiry to us.

DOREMUS & COMPANY
Dept. 84
Advertising
120 Broadway, New York City

NOTICE

POST WAR WORK

Midwest company with modern plant, heavy cranes, railroad sidings, capital wants new ideas for manufacture or use of plant; practical for any development. Connection with company possible or other arrangements. Also interested in representing manufacturers, using plant for warehouse purposes and servicing.

BO-524, American Machinist
520 N. Michigan Ave., Chicago, Ill.

FOR SALE—PRICED RIGHT MODERN MANUFACTURING PLANT

Well equipped with Metal Fabricating Machinery—Brick Building

HAS—40,000 SQ. FT.—GOOD LIGHT—SPRINKLER SYSTEM — LOADING DOCKS—EXCELLENT SHIPPING FACILITIES—WELL EQUIPPED OFFICE —FINE HEATING PLANT.

HAS PLENTY OF GROUND FOR ADDITIONAL BUILDINGS. GOOD LABOR MARKET. LOCATED IN LAPORTE, INDIANA.

BO-537, American Machinist
520 N. Michigan Ave., Chicago, Ill.

THE NICHOLS TABLE OF SCREW THREADS AND TAP DRILLS
$1.75

Now is the time to order your copy. One table, 60 PAGES long, listing all standard screw threads with essential thread data.

THE NICHOLS CO. 1313-K ST. S.W., CEDAR RAPIDS, IOWA

NEW INVENTIONS WANTED

Mechanical and electrical devices which can be used to promote our war production program. Either new ideas, or improvements upon present methods.

P. O. Box 217, Denville, N. J.

CONTRACT WORK

MACHINES AND PARTS, SPECIAL TOOLS, ETC.

to your specifications

SPECIAL ENGINEERING WORK

. . . on Contract

It will pay you to investigate our facilities. As designers and builders of wire and ribbon stock forming machines we can offer you skilled and experienced assistance. Send us your blueprints or samples for prompt quotations.

We also solicit your bids for cam milling

THE A. H. NILSON MACHINE CO. *Bridgeport, Conn.*

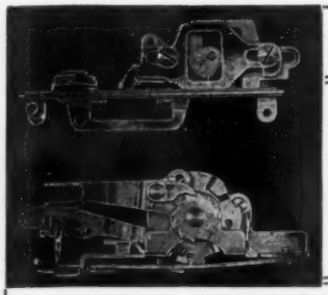
ESSEX MACHINE WORKS
ESSEX, CONN.

•

Contract Manufacturing and Industrial Machine Work

•

Producing For War
Planning For Peace



STAMPINGS and ASSEMBLIES

We can make long or short runs in any metal. Our modern equipment and methods, backed by 50 years of experience, are your guarantee of satisfaction. Our manufacturing facilities also include screw machine products, tools, dies, jigs and fixtures.

Your order is assured of quality workmanship by skilled mechanics. We will furnish prompt quotations on your blueprints or samples. Write us today!

". . . Savings with Greist"

THE GREIST MFG. CO. 546 Blake Street New Haven, Conn.

SUB-CONTRACT FACILITIES FOR

Hand screw machine products.
Engine and bench lathe, milling the drill press work.
Small sheet metal fabrications to closer than commercial tolerances.
Stampings.

We do our own tooling

RELIANCE MACHINE & MFG. CO.
Thirty Irving Place New York City
36 years experience in metal fabrication

PATTERNS in WOOD and METAL
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22 Miles from Philadelphia, Pennsylvania

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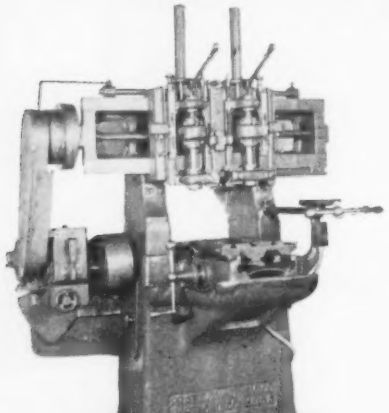
PROFILER



Pratt & Whitney #12 two spindle motorized profiler. Table 12"x15" equipped with 6" raising blocks, and 5 H. P. 3 ph. 60 cy. 220 V. motor—Turner drive mounted and wired to push bottom control—Rebuilt and guaranteed

MILLING MACHINES

P & W Duplex Miller #2
Becker #7 Lincoln Production Miller
Sanford #1½ Production Miller, Rotary Table
Cleveland Vertical Miller #1—(New)
Index Universal Vertical Millers (New)
No. 1 Brown & Sharpe Univ. Plain Milling Mach.
No. 1½ American Universal Milling Machine.
1—No. 2 Owens Plain Horizontal Milling Machine.

GEAR CUTTERS

No. 1 ADAMS FARWELL Gear Hobber; complete.
No. 2 WHITON SPUR GEAR CUTTER, Auto.

SHAPERS & SLOTTERS

24" Cincinnati Triple Geared Shaper, Fric. Dr.
20" Steptoe Back Geared Crank Shaper Cone Drive.
30"x20"x24" N-B-P SHAPER-PLANER, arr. M.D.

24" Bullard Rapid Production, M.D.
30" Coburn Vertical Turret Mill, M.D.
3½" Rochester Floor Type Horz. Boring Mill, M.D.

RADIAL DRILLS

2—Niles, Bement-Pond, flat column 5' arm.
Niles Bement-Pond, flat column 6' arm.

COILING MACHINES

No. 1 and No. 2 SLEEPER & HARTLEY BX CABLE COILING MACHINES ⅜ and ½" cap. Last used for Speedometer cables Complete.

DRILL PRESSES—HIGH SPEED, BALL BEARING; SLIDING HEAD; SCREW EL. TABLES

4-Spindle Foot-Burt High Speed Ball Bearing with power feed to each spindle; automatic quick return, tight and loose pulley drive; 8" overhang No. 2 Morse Taper; table working surf. 14"x48".
1-Spindle Avey No. 2, 8" Overhang, No. 2 M.T. with Power Feed; Ball Bearing.
2-Spindle Avey No. 2, 8" overhang, No. 2 M.T. Plain Hand Feed; Ball Bearing.
2-Spindle Leland Gifford No. 2 M.T. 10" Overhang. Power feed to one Spindle.
2-Spindle KERN No. 2 M.T. 8" Overhang.
2-Sp. Henry & Wright, 8" Overhang, No. 2 M.T.
1-Sp. EDLUND No. 2B, 8" Overhang, No. 2 M.T.
1-SPINDLE ALLEN No. 2 M.T. 8" Overhang.
1-Spindle FOSDICK with TAPPING MECHANISM On SPINDLE, No. 2 M.T. 8" Overhang.
1-Spindle KOKOMO No. 3, 12" Overhang, Quick Change Gear Box; No 3 M.T.
1-Spindle Henry & Wright 8" Overhang, No. 2 M.T.
15" BUFFALO Motor Driven ½" Cap. Drills, NEW.
18" BUFFALO NEW DRILLS, 1" Cap. M.D.
10" BURKE BENCH DRILLS—many in stock.
7-Spindle Sigourney Gang Sensitive Drill No. 2 M.T. 7½" Overhang.
3-Spindle ROCKFORD Plain 20" Power Fd., B.G.
2—Barnes drill 20" cap. #3 Morse Taper.
1—Buffalo Forge drill 20" cap. #3 Morse Taper.
Avey drill, two spindle #2 Morse taper.
Avey drill three spindle size ½.
Cincinnati 24" upright heavy duty.

KEYSEATER

No. 3½ BAKER 72"x3" Cap. immediate delivery.

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6000# Crescent Lo-Lift Electric Trucks, Platform 26" x 54" (3).
Abbott burnishing barrel 8" x 36".
Degreaser size 48" x 21" x 20".
Torrington Slitter, for 30" tin plate, 3 sets of cutters.
Blakeslee metal washer.
Cleveland Type G, 48" Single End Punch 2" thru 1" Cap Arr. A.C. Motor drive.

SAWS

Peerless, saw size 10 x 10.
Racine Saw size 6 x 6, 9 x 9.
Racine Saw size 9 x 9.
Toledo, New, 6 x 6.

GRINDERS

14" Pratt & Whitney Vertical Surface Grinder.
No. 6 Besley Double Opposed Disc Grinder.
No. 2 & No. 3 Brown & Sharpe Cutter Grinder.
Taft-Pierce Automatic Pin Grinder.
Gardner No. 4 Disc Grinder Double End, 20" disc, 16" ring wheel, ball bearing belt drive.
Badger No. 2 Double End Disc Grinder 16" disc, ball bearing spindle, Universal table.
1—Gisholt Drill Grinder.
Badger No. 2—16" Disc. Dbl. End. Univ. Tbls., Belt.
Gardner No. 1—double end Disc, 12", B.B. belt dr.
Gorton, double end disc grinder, 18" discs.
Sellers drill grinder.
#1 Le Blond tool and cutter grinder.

INTERNAL GRINDER

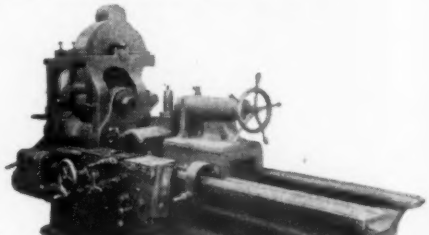
GREENFIELD No. 12, HYDRAULIC FEED, Motor Drive; Cap. swings 15"; Grinds automatically ¾" to 5" dia.; 4" Deep; New in 1928.

TURRET LATHES

1¼" Gridley "F" 4 spindle Automatic Screw Machine.
Milholland Geared Head Hand Screw Machine 1½" cap. Arranged motor drive, now equipped as Milholland Lassiter Staybolt Machine.
Jones & Lamson 3 x 36", Double Spindle, Motor Driven with Air Truck equipment.

LATHES

20 x 10' Mueller Lathe Q.C.G. Taper Attachment, Chuck, Double Back Geared.
30"x12' Putnam Quick Change Gear Screw Cutting Engine Lathe, Arranged Motor Drive.
18x10' Reed Plain Change Lathe.
18"x12' Hamilton Plain Change Lathe.
18x6 South Bend Plain Change Lathe.
16x6 South Bend Plain Change Lathe.



30" x 12' Putnam Quick Change Gear Lathe.
10" x 24" New Logan lathes, with collets, etc.
Lodge & Shipley 26-28" x 21' bed, 14' 6" Centers, Taper Attachment, Pan Bed with Oil Pump.

THREAD ROLLERS

2—#0 Waterbury & Farrell thread rollers.
1—#30 Waterbury & Farrell thread rollers.
2—#22 Waterbury & Farrell cold header & double stroke solid die.
1—#33 Waterbury & Farrell cold headers & double stroke solid die.

TRIMMERS

2—Waterbury-Farrell Automatic Trimmers ⅝ cap.

THREAD MILLERS

Hall Planetary No. 2—24" Swing.
Lees-Bradner No. 8—12"x54.
Pratt & Whitney 6x14.

THREADING MACHINES

1½" Acme Single Head Bolt Threader, like new.
Acme ⅝" Double Head.
Acme 3" Single Head.
Landis 1½" Single Head Bolt Threading Machine.
National 2" Double Head, Geared M. Dr.
Williams 6" Pipe Threading Machine.
Merrill 10" Pipe, Motor Drive with motor.
Curtis Portable 4" Pipe Threading Machine.
Williams 2" Pipe Threading Machine.
Jarecki 2" Pipe Threading Machine.

AUTOMATIC CHUCKING MACHINES

1—No. 24 New Britain type 4 spindle, 5 chucking stations.
1—No. 23 New Britain type 4 spindle, 5 chucking stations.
1—Jones & Lamson Hartness Automatic Chucking Lathe Motor Driven 12" diam., 6" face, 6" width cap.

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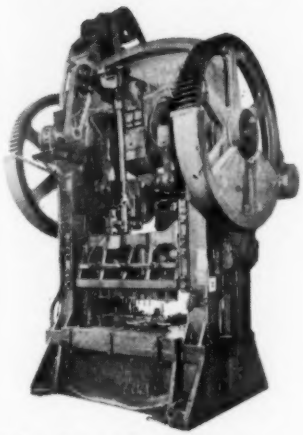
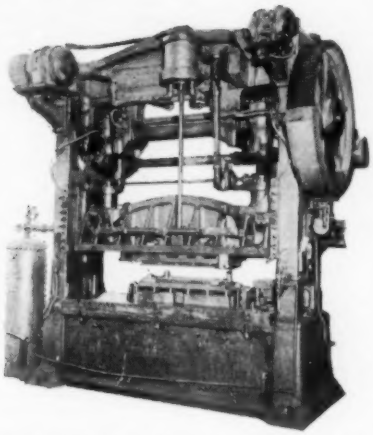
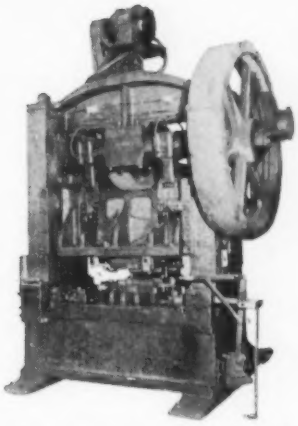


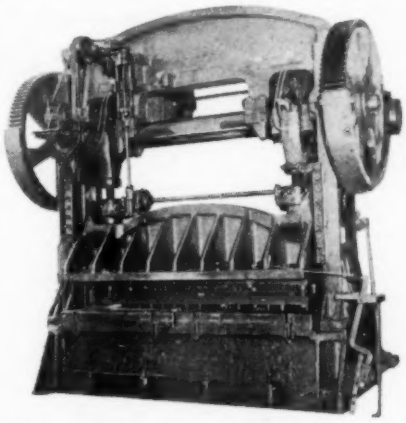
TOLEDO 96-C—Straight side, tie rod, double crank, double geared, twin geared, V-belt M.D., with 30 H.P., 3 Ph. 60 Cy. 440 V. motor & controller, separate motor for regulating ram. Forced feed lubrication, pneumatic controlled friction clutch & brake. Bed area—72"x51", 6" stroke, 18" sheet height. Marquette air cushioned bed. Serial No. S26203—375 ton press capacity, weight 115,000 lb.



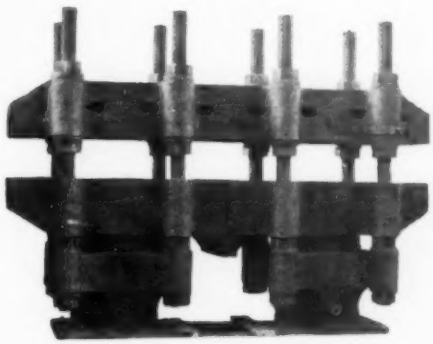
TOLEDO 93½-I—Straight side, tie rod, double geared, double crank, 15 H.P. V-belt motor drive—3 ph. 60 cy. 440 V. motor & controller. Separate motor for adjustment of ram. Forced feed lubrication, pneumatic controlled friction clutch & brake, air cy. pull back on ram. Bed area 96"x34", 6" stroke. Spring cushioned bed 18½" sheet height, weight approx. 42,000. Serial No. S26243—approx. 175 ton.



BLISS NO. 7—Straight side, tie rod, back geared V-belt M.D. with 15 H.P. 3 ph. 60 cy. 440 V. motor & controller—manual operated adjustment of ram. 175 ton press cap. Forced feed lub. Pneumatic controlled clutch & brake. Bed area 64"x37", 4" stroke. 22" sheet height, spring cushioned bed. Rebuilt by Toledo 1937. Serial No. BX9002—4877—90. Weight approx. 43,000 lb.



TOLEDO 94½-J—Straight side, tie rod, double geared, twin geared, direct geared M.D. with 30 H.P. 3 ph. 60 cy. 440 Volt motor & controller. Forced feed lubrication, pneumatic controlled friction clutch & brakes. Bed area—120" right to left x 50" front to back. 12" stroke, 18" sheet height. Bed equipped with spring cushions. Separate motor for adjustment of ram. Serial No. S25481—approx. 200 ton press, weight approx. 80,000 lbs.



SOUTHWALK 520 Ton Hydraulic Press brake. Bed area 144" long x 30" wide between posts. Stroke of ram 12", Diameter of ram 21". Daylight max. 30". Complete with Lourie 4 plunger type pump with direct geared 15 H.P. motor 3 ph. 60 cy. 220 V. Total wt. 63,000 lbs. In good usable condition.

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5½" Cleveland Model A
14"x19" Fay
No. 6A Potter & Johnston
4½" Gridley model H
6"x6¾" Goss & DeLeeuw
1" Cleveland "J" double end
No. 16 Gisholt Simplimatics
1⅝" No. 55 National Acme
7" Baird 6 spindle

PUNCHES

1¼"x1", 12" throat No. 1½ Long & Alstatter
1¼"x1", 12" throat Cleveland horizontal
¾"x¾", 26" throat style G Rock River

DRILLS

15" & 20" Buffalo
16" Sibley
20" Lindgren
20" Silver
21" Cincinnati
22" Barnes
23" Mechanics
20" No. H 2 Barnes Hydraulic feed
24" No. H 3 Barnes Hydraulic feed
Natco multiple Nos. 11, 12, B12, C12, C13, 14, 30 and 32, 8 to 62 spindles
Nos. 1 & 4 Baush multiple
No. 13 Pratt & Whitney multiple
Nos. 15½, 15½D and 15½ F Foote Burt manufacturing
No. 8H Natco hydraulic horizontal multiple
Nos. 0 and 00 Garvin duplex
4"x72" Sundstrand centerer
4" Hammond radial
Sensitive drills. Almost all makes and sizes
Barnes vertical hydraulic feed drilling, boring & reaming
Edlund semi-special 3 motor production drill

BULLDOZERS

No. 1 Rock River, 5½"x32" cross head
No. 29 Williams & White, 16"x90" cross head

GEAR MACHINERY

No. 16 HS Gould & Eberhardt hobber
No. 12 Barber Colman hobber
No. 1 Lees Bradner hobber
26"x8" Brown & Sharpe automatic
24"x12" Flather automatic
36"x6" Gould & Eberhardt automatic
60" No. 5A Cincinnati automatic
18" Gleason testers & lappers
15" Gleason spiral gear roughers
15" Gleason spiral pinion roughers
18" Gleason bevel gear generator
2 spindle Lipe chamferer
Pratt & Whitney worm grinder
National gear checker

MILLING MACHINES

No. 3 Turnmilling for round work
Nos. 1 & 1A Davis & Thompson drum type duplex
48" Oesterlein tilted offset
Nos. 10 & 45 Productomatics
5" and 12" Pratt & Whitney automatics
Model AB Becker vertical
Type C Hall planetary thread miller
Taft Pierce thread miller
28" Cincinnati Duplex
3⅞" Beaman & Smith horizontal boring mill
36" Garvin cam & form miller

PLANERS

24"x24"x5' Gray
24"x24"x6' Woodward & Powell
29"x29"x6'3" New Haven
36"x36"x10' Betts 2 heads

GRINDERS

10x36 10x50 and 14x50 Norton
12x36 12x52 16x48 and 16x60 Landis
Capitol internal
Nos. 6 & 15A Bryant internal
20"x50" Safety surface
Nos. 50 & 60 Heald cylinder
18", 24" & 30" Gardner disc
24" No. 84 Gardner opposed disc
24" No. 221 Hanchett opposed disc
20" No. 120A Gardner opposed disc
17"x36"-48" Norton hydraulic crankshaft
Gisholt tool grinder
24" Ingersoll face milling cutter grdr.
30" Ransom elec. snagging
16" Norton snagging
No. 575 Hawes tube polisher
18" Whitney wet tool
36" No. 5TGM Bridgeport wet
Cincinnati face milling cutter grinder
Pratt & Whitney grinder for worms or threads
Gear Grinding Mach. Co., Type VSG 1 radius grinder
Gould & Eberhardt gear cutter grinder

LATHES

28" Steinle, 8" hole, 80" centers
24" Gisholt, 6¼" hole
24" Steinle, 6¼" hole
22" Libby, 4½" hole
2¼x24 & 3"x36" Jones & Lamson
No. 1, ⅝" capacity hand screw
Nos. 4 & 5 Foster
13"x6' Automatic threading
Melling crankshaft 6 cylinder
3½"x36" & 4"x36" Lo Swing lathes
27"x14' Bridgeford heavy turning or axle 2 carriage
8" Sundstrand stub
9" Sundstrand Mfg.
1"x18" Pratt & Whitney automatic
14"x6' Lodge & Shipley with turret on carriage
22"x124" American with turret slide
21" LeBlond crank shaft

METAL SAWS

6"x6" Toledo hack. New.
4", No. 12 Higley cold saws.
5½", No. 15 Lea Simplex cold saw.
6" Nutter & Barnes cold saw.
7", No. 14 Higley cold saws.
8" No. 17 Higley cold saw.
No. 2 Grabo metal saw tables.
8"x16" Kalamazoo band saw. New
36" blade Newton cold saw.
No. 17 Racine abrasive cutoff.

SHEARS, SHEET METAL, & WIRE

No. 180 Tessmer sprue cutter.
No. 1 Hilles & Jones alligator shear.
1½" Lewis alligator shear.
2" Newbold gillotine shear.
20" Pels armor plate beam shear.
No. 3 Pawtucket bar shear, 4"x½" flats.
No. 352 Toledo band roller, 2"x¼".
No. 3 RH Magee wiring machines.
⅝"x3' Shuster wire straightener and cutter.
Sleeper & Hartley flexible casing coiler.
Sleeper & Hartley spring coiler, ⅝" capacity.

WELDERS

Type 3 Toledo butt, ¾" capacity.
25 KW Winfield No. B8 butt.
65 KW Federal No. 10-A butt.
10 KVA Dyer spot. New.
10 KW Thomson spot, 110 volt.
12.8 KVA A. E. F. spot.
15 KVA Taylor Winfield spot.
20 KW Taylor Moesta portable spot.
20 KVA Taylor spot.
20 KVA Taylor spot.
23 KVA Winfield spot.
150 KVA A. E. F. type HJ10 special multiple spot.
375 KVA Fisher "Autocrat" press or projection type.

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Lathe & Morse 26" x 12'
Pittsburgh 26" x 10' Q.C. M.D.
Adams 14" x 5' C.H.

MILLERS

#12 Brown & Sharpe Production
Pratt & Whitney Table 6 x 32"
#3 Garvin Duplex 12 x 64"
4" Bickford Horiz. Boring Mill S.P.
2" Binsee Horiz. Boring Mill

GRINDERS

Modern, Cylinderical 16 x 60" M.D.
Crocker-Wheeler Disc Grinder
#3 Van Norman Relio Grinder, Cylinderical M.D.
Storm Grinder
Diamond Surface Grinder, 12 x 14 x 54"
Diamond Surface Grinder, 16 x 16 x 56"
#16 Blanchard Grinder

PLANERS

American—36 x 36 x 8' M.D. 2 Heads
Gould Machine Co. 18 x 12 x 36" Table 14½ x 36"

AUTOMATICS

#53 National Acme, 1" Cap.
#55 National Acmes, 1⅝" Cap. M.D.
Gridley, Model G, 1¼" Cap.
Gridley, Single Spindle, 2¼" Cap.
Gridley, 4 Spindle, 2¼" Cap.
New Britain, 6 Spindle, 1⅝" Cap. M.D.

TURRET LATHES

Milholland—1⅝" Cap. M.D.
Gisholt—21", 2" thru spindle
Gisholt—5¼" thru spindle
Pratt & Whitney—2¼" Cap.

DRILL PRESSES

Eberhardt—24" Sliding Head
Foote Burt—Heavy Duty, 2" Cap. S.P.D.

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10" G & E M.D.
24" Rockford M.D.
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18" Robar

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G.E. 3 x 36" Spur
G.E. 36"

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Niagara Power Press #66-E
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Beasley Ball Bearing Grinder, 16"
Form Rolling Machines 5 Sets of Form Rollers
Thompson Spot Welder—50 KVA Air Operated
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Radiac Cutoff
Atkins & Racine Hacksaws
Oster Threader
Standard 2" Bolt Cutter

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Refinements incorporated by Hill-Clarke in these machines assure precision, minimum vibration and a finish which requires no extra grinding time. Even when using standard grain free-cutting wheels, these machines can be depended on for super-grinding and micro-finish.

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Partial Listing of Items In Stock Subject to Prior Sale

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DRILLS—5' Bickford Radial, 13" column, mtr. drive
4 spindle Leland-Gifford B.B., Sensitive, #2 taper, tapping attachment.
16" Henry & Wright, belt drive, Sensitive, B.B., #2 M.T.
16" Edlund belt drive, Sensitive, B.B., #2 Morse T. 8 spindle Baush, belt drive, 36" diam. head #4 M.T.

GRINDERS

#6 Bryant Internal Grinder, 12" swing, belt drive
Springfield Planer Type, Surface, cap. 12"x50".
18" Gorton Disc Grinder, belt drive, two universal tables.
6"x18" Landis, plain, self-contained motor drive
#2 Cincinnati centerless, motor drive (New 1928)

LATHES

26"-48"x16' McCabe, double spindle, belt drive, 10' centers.
20"x8' Boye & Emmes, belt drive d. b. g. quick change.
18"x14' Hamilton belt drive, quick change.
18"x12' LeBlond, belt drive, plain change gear.
16"-23"x8' South Bend Gap Lathe, belt drive.
16"x6' Pratt & Whitney, quick change, belt drive taper att'mt.

LO-SWING

3½"x60" Fitchburg Lo-Swing, motor drive, 2 carriages.

MILLERS—#2 Brainard Plain, belt drive, table 8"x30"
Hendey "Lincoln" type Production Miller, table 9"x30", b. dr.
#1 U. S. Hand, belt drive, table 5"x20".
Newton Planer type 15" between the uprights, table 14x54
18" Cincinnati plain knee type Miller, table 12"x34", slotted spindle nose.

PIPE MACHINES

½"—2" Landis, belt drive, lever operated chuck.
2½"—8" Williams, motor drive, quick opening diehead.
½"-2" Red-E-Haul Portable, motor drive
½"-2" Robbins & Gamwell, Portable, Motor drive

PUNCH

24" throat, Bement Single End, belt drive, cap. ⅝"x⅝".

PLANERS—24"x24"x6' Putnam, belt drive, 1 head.

SHAPERS—24" Barker, single geared, belt drive,.
20" Barker, back geared, belt drive.

SLOTTERS—6" Newton, belt drive, 18" table
10" New Haven, belt drive, 24" table.

TURRETS—#1 Foster arranged for bar work ¾" cap., b. dr.

WHEEL PRESSES

200 ton Caldwell, 38" between bars, motor drive, with pump.

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THE O'BRIEN MACHINERY CO.

PHILADELPHIA'S LARGEST MACHINERY DEALERS AND EXPORTERS

113 NORTH THIRD STREET • PHILADELPHIA - PENNA.

BELL TELEPHONE: MARKET 4180 CABLE ADDRESS: OBRIEN-PHILA

LATHES

1—Porter McLeod 16" x 8' QCG Engine Lathe
3—New Robbins 14" x 8' Motor-in-Base Timken Bearing Lathes.
1—Lodge & Shipley 16" x 8' QCG Engine Lathe, M. D. Pan bed.
1—Bradford 14" x 6' Tool Room QCG M. D. Lathe.
1—Reed-Prentice #2 Production-Auto. Lathe. Swing over bed 10". 39" between centers. Back tool slide.
1—Sellers #709 Engine Lathe. Swing 36" x 19'.
1—Bridgeford 26" x 12' Heavy Duty M. D. DBG QCG Engine Lathe.
1—Johnson 30 x 24 Triple Geared Lathe.
1—Pratt & Whitney 14" x 6' Semi-QCG Engine Lathe.
1—LeBlond 14" x 8' QCG Engine Lathe—M. D.

1—Gridley 2½" Single Spindle Automatic Screw Machine—Ser. #3606.
1—Goss & DeLeeuw 6" x 6¾" 5-Spdle. Chucking Machine—Ser. #220.

HAMMERS

1—E. W. Bliss 600-lb. Board Drop Hammer.
1—Bradley 80-lb. Rubber Cushioned Helve Hammer.
1—Bell 600-lb. Steam Hammer and base.
1—Chambersburg 1200-lb. Hammer.
1—Bell 850-lb. Guide Ram Type Steam Hammer.

GRINDERS

1—Norton 10 x 50" Cylindrical Grinder—M. D.
2—Bryant #12 Internal Hole Grinders—Factory M. D. 15⅛" swing.
1—Cincinnati #1½ Universal Tool & Cutter Grinder.
1—Van Norman #40 External Radius Grinder.
1—Gardner #24—53" Disc Horizontal Grinder.
1—Cincinnati #1½ Tool & Cutter Grinder with equipment.
1—Heims #2 Centerless Grinder—M. D. Has hand injector feed, through feed, and end feed. Ball bearing spindle.

MILLERS

1—Pratt & Whitney 6" x 48" Thread Miller.
1—Becker #1 Vertical Miller with foot treadle and 13" rotary table.
10—Pratt & Whitney 12" Automatic Millers with receding tables.
1—Cincinnati 28" Plain Miller—Semi-Automatic with Intermittent Feed and Power Quick Return.
1—Becker #25 Miller—Working surface 27" x 8½".
1—Garvin #11 Indexing Miller with indexing fixtures.

This is only a partial listing of our Machinery in stock.

Botwinik Brothers of Mass. Inc.

94 GOLD STREET WORCESTER, MASS.

IF YOU ARE DOING DEFENSE WORK

Send for Our Latest Circular Covering Bargains in Small Tools Such as Drills, Reamers, Turret Attachments, etc.

DeWITT TOOL COMPANY

173 Grand St. New York City

AUTO. SCREW MACHINES

1⅜", 1¾", 2¼" Gridley 4 spindle

1", 2¼" Nat.-Acme 4 spindle

3¼", 4¼" Gridley sgle. spindle

CANAL MACHINERY COMPANY

176 LAFAYETTE STREET, NEW YORK, N.Y.

12" x 96" **LANDIS** Plain Cylindrical Grinder. Automatic Feed Machine.
28" x 24" x 24" stroke **CINCINNATI SHAPER COMPANY** Crank Planer. One head on rail, arr. for double tool blocks.

ALSO MANY OTHER TOOLS

ALEX ZEEVE & COMPANY

2269 Woolworth Building New York, N. Y.

UNUSUAL VALUES

Lodge & Shipley geared head lathe, motor drive, 16" x 10'.
3½"x50" **Fitchburg Lo-Swing Lathe.**
Turret, Lodge & Davis, Brass cross slide turret.
Brake: Robinson toggle 5'.
Drill Presses: 28", 24" Hoefer; 25", 20", 40" Bement
One No. 8-7 Zeh & Hahnemann straight side press, geared.
New Buffalo 10" motor driven **bench drill.**
Ceiling Suspended Drill Unlimited drilling area.
Grinders: #20 Bryant Internal.
60" **Plate Grinders.**
#60 **Heald** cylinder grinders.
Sellers Tool Grinder.
Rock River ⅞" capacity **punch and shear.**
1—3 spindle 1" capacity **Bolt Cutter.**
1—2 spindle #0 **Webster & Parks Threader.**
Bolt Cutter 1¾ **Acme with Landis Head.**
Vacuum Cleaner, Invincible, shop use.
Two ½" **punches and shears.**
MOTORS—new ½ to 30 H.P., 3 phase Ball brg. Also rebuilt motors.

THE OSBORNE & SEXTON MACHINERY CO.

COLUMBUS, OHIO

No. 3 Crescent Saw Table
No. 2 P & W Shaving Machine
72" x 36" x 10' table Ingersoll Mill
24" x 24" x 6' Wilson Planer, one head

D. E. DONY MACHINERY CO.

New and Used Machine Tools

47 Laurelton Road Rochester, N. Y.

POWER PRESSES

BLISS, TOLEDO, V & O, ETC.
REBUILT — GUARANTEED

JOSEPH HYMAN & SONS

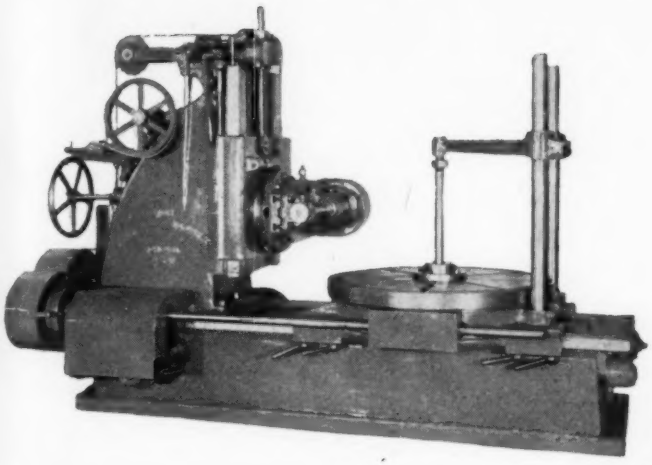
Tioga, Livingston and Almond Streets
Philadelphia, Pa.

50" x 28' Norton Roll Grinder, M.D.

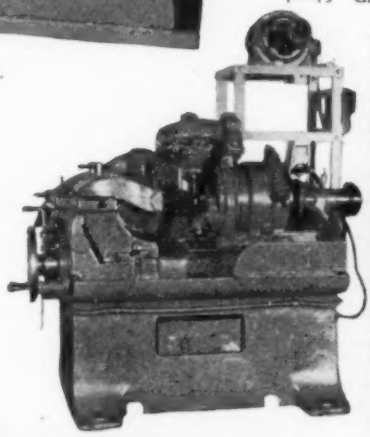
AARON MACHINERY CO.

45 Crosby Street New York, N. Y.

GEAR MACHINES for your PRODUCTION PROBLEMS



4—No. 5-A Lees-Bradner Gear Hobbers
4—15" Gleason Spiral Bevel Gear Generators (Finishers)
2—15" Gleason Pinion Gear Generators (Roughers)
1—15" Gleason Bevel Gear Generator (Rougher)
1—No. 13 Brown & Sharpe Gear Cutter
1—No. 3—26" Brown & Sharpe Gear Cutter
1—No. 4—36" Brown & Sharpe Gear Cutter
1—24" x 8" Gould & Eberhardt Gear Cutter
1—36" x 12" Gould & Eberhardt Gear Cutter
1—20" Ingle Gear Tooth Rounder
1—Cross Double Head Gear Tooth Rounder
1—No. 40 Cross Hydraulic Gear Tooth Rounder
2—Pratt & Whitney Gear Tooth Grinders
1—Lipe Chamfering Machine
1—Lipe 2-sp. Chamfering Machine
2—No. 3 Peerless Chamfering Machines
2—Red Wing Lappers
1—15" Gleason Bevel Gear Tester



1—No. 3 Barber-Colman Gear Hobber
3—No. 12 Barber-Colman Gear Hobbers
1—No. 2—36" Schuhardt & Schutte Gear Hobber
1—No. 48 Jones Gear Hobber
1—52" x 12" Gould & Eberhardt Gear Cutter
1—62" x 14" Gould & Eberhardt Gear Cutter
1—No. 2½ Bilton Gear Cutter
2—No. 1128 Michigan Gear Cutters
1—4 Sp. 7" x 4" Gould & Eberhardt Gear Cutter
1—14" x 7" Maag Gear Shaper

QUICK DELIVERY FROM OUR STOCK

We invite your inspection of these machines at your earliest convenience. Our engineers will gladly help you solve your Production Problems.

WIRE—WRITE—PHONE

LOUIS E. EMERMAN & CO.

871 W. 120th ST. CHICAGO, ILL.

BORING MILLS

Colburn 54", 2 heads.
Niles 53", 2 heads.
Bullard 36", 2 hds.

Canal Machinery Company
176 Lafayette St., New York, N. Y.

Announcing Our New Location

6—Gleason Gear Cutters, 11" and 18" machines
52x20' New Haven Lathe
48" Boring Mill
12—25 KVA Spot Welders
48x8 Planer
500# Board Drop Hammer
1000# Steam Hammer
Cleveland Automatics—⅜", 2¼", 2¾", single spindle
Arter Grinder, 6x20, cylindrical

Paul's Motor & Machinery Supply Company
6111 Vermont St. Detroit, Michigan
Tyler 76300-02

BOLT AND PIPE THREADERS—1½" & 3" National; 10" & 6" Saunders Pipe; 2½" Landis Bolt, M.D.
BORING MILLS—10" Betts Heavy Duty, 102" table, M.D.; 72" Betts, M.D.
CHUCKER—#34 New Britain.
GRINDERS—30" x 240" Landis Cyl. 24" Bridgeport Disc D.C., M.D. 24" x 96" Landis Cyl. 20" x 96" Landis Cyl.; 14" x 96" Cinci. M.D.; 12" x 96" Landis; 12" x 120" Landis; #6 Landis Internal.
GEAR CUTTERS—11" & 6" Gleason Bevel Gear Generators; 36" G & E Spur and Bevel; 36" Newark Spur, new 1928; 36" x 10" Cinci. spur (2); 15" Gleason Bevel Gear Planer.
KEYSEATERS—#1 Baker, 12" stroke x 1¼" wide. #6 Catlin 40" stroke x 5" wide.
PLANERS—48" x 48" x 16' Cinci., 4 hds., M.D.; 36" x 36" x 12' Putnam, 3 hds., M.D.; 38" x 38" x 16' Ingersoll 3 hds.; 36" x 36" x 10' Flather, 2 hds., M.D., 26" x 8' Gray; 27" x 27" x 6' Woodward Powell, M.D.
LATHES—12" x 5' Master M.D.; 16" x 6' Pratt & Whitney; 18" x 6' S.B. & E., taper; 24" x 14' Johnson; 32" x 12' Pittsburgh, Q.C.G. blocks to 44"; 36" x 14' Rahn Larmon, 36" x 16' Bridgeford Grd. Hd., T.A.; 64" x 28' New Haven.
TURRET LATHES—3" x 36" J. & L., Bar Work; 3" x 36" Jones & Lamson, arranged for bar work, geared head.

ROSENKRANZ MACHINERY CO.
30 Church Street New York, N. Y.

DIAMOND PRECISION BORING MACHINE
Type A 126 Coulter
Motor Drive-Mechanical Feed
BENNETT & RAFKIN CO.
30 Church St. New York City

3—Potter & Johnson No. 6A Turret Lathes.

AARON MACHINERY CO.
45 Crosby Street New York, N. Y.

KEEP 'EM RUNNING!

Every machine listed in this column is in our warehouse at press time.

●

30" x 16' N.B.P. Geared Head Engine Lathe, Quick Change Gears, 230 V.D.C. Motor.

50" x 32' PITTSBURGH Heavy Triple Geared Engine Lathe, Quick Change Gears, 230 V.D.C. Motor.

4½" x 30" BARDON-OLIVER Turret Lathe, Geared Head, Motor Drive.

24" G&E Spur Gear Cutter, M.D.

36" B&S Spur Gear Cutter, M.D.

60" B&S Spur Gear Cutter, M.D.

50" G&E Spur and Bevel Cutter, S.P.D.

90" P&W Spur and Worm Cutter

6" BILGRIM Bevel Gear Generator

15" GLEASON Bevel Gear Generator

No. 9 N.B.P. Vertical Miller 39" rotary table, 4" dia. spindle, M.D.

No. 10 N.B.P. Vertical Miller 42" rotary table, 5" dia. spindle, M.D.

30" x 30" x 10' NEWTON Slab Miller horizontal arbor, M.D.

48" x 48" x 20' PATCH Planer, 4 heads, 230 Volt D.C. Rev. Motor Drive.

60" NEWTON Portable Slotter, 230 Volt D.C. Rev. Motor Drive

SIMMONS ENGINEERED *Machine Tool* REBUILDING

SIMMONS MACHINE TOOL CORP.

1759 North Broadway, Albany, N. Y.

N. Y. Office: 149 Broadway

LATHES

40" x 20' McCabe Lathe, Cone Drive, Trip. Grd.

56" x 18' Putnam Turning Lathe, Belt feed.

GRINDERS

#14-20" Besley Disc Grinder.

Fitchburg Spline Shaft Grinder.

#55 Heald Cylinder.

MILLERS

#1 P & W Hand Miller.

GEAR MACHINERY

18" Gleason Bevel Gear Generators.

6" Bilgram Bevel Gear Generator.

18H Gould & Eberhardt Gear Hobber.

#1 Adams Gear Hobber.

#4—36" B & S Automatic Gear Cutter.

Lees Bradner Gear Grinder.

#3-26" B & S Gear Cutter.

PLANERS

24" x 6' Cincinnati Planer.

MISCELLANEOUS

18" Niles Bement Pond Slotter, Motor driven thru gear box.

12 Ga. 30" Throat Quickwork Shear, M.D.

14" Niles Slotter.

1500# Bell Steam Hammer.

CINCINNATI MACHINERY & SUPPLY CO.

217 East Second Street Cincinnati, Ohio

LATHES

14"x6' Mulliner—cone
14"x6' Lodge & Shipley—cone
16"x6' Lodge & Shipley—cone
18"x10' Lodge & Shipley—Gd. Hd.

MILLING MACHINES

No. 2 Kearney & Trecher Pl. Motor in Base
No. 2B Kearney & Trecher Pl. Motor in Base
No. 2H Kearney & Trecher Vertical, Motor in Base
No. 3MS Cincinnati Vertical, Motor in Base
No. 3B Kearney & Trecher Pl. Motor in Base
No. 3 Kearney & Trecher Pl. Motor in Base

GEAR MACHINERY

No. 6I Fellows Gear Shaper, M.D.
No. 12 Barber Colman Gear Hobber, M.D.
24H Gould & Eberhard Gear Hobber, M.D.
9" Pratt & Whitney Gear Grinder, M.D.
11" Gleason Bevel gear generator
Cimatool gear chamfering M.D.
Lees-Bradner Gear Grinder

TURRET LATHES

No. 4 Warner & Swasey Gd. Hd. M.D. 6"x6½"
Goss & DeLeeuw
Jones & Lamson Automatic (FAY)

INTERNAL GRINDER

No. 3 Bryant, M.D.
No. 70A Heald, M.D.
No. 72—A-3- Heald Sizematic M.D.

MISCELLANEOUS

8" Bullard Multimatic M.D.
No. 1 Foote Burt Duplex Surface Broach M.D.
24"x24"x8' Whitcomb Planer
36"x36"x8' Woodward & Powell Planer Rev. M.D.
No. 303 Bliss St. side, Gd. Press M.D.
Lees-Bradner Thread Miller 60"

DRILLS

3' Cincinnati Bicksford
No. B-16 Natco, M.D.
4 Spindle Taylor & Finn, M.D.
3 Spindle Leland Gifford, Power feed

WIGGLESWORTH MACHINERY CO.

203 Bent St., Cambridge, Mass.

ST. LOUIS' Headquarters

FOR GOOD USED TOOLS, OFFERS:

ROCKFORD 24" S.P.D. Shaper
COLBURN 42" Vert. Boring Mill
MUELLER 4½' Gear Box Drive-Radial Drill
PUTNAM 27"x14' Q.C.G. Lathe
PRENTICE 24"x12' M.D. Grd. H.D. Lathe
GISHOLT 30" Vert. Turret Lathe
CIN. 48" Pl. Auto. Miller M.D.
NILES 12" Vert. Slotter
INGERSOLL 2—SP. Vert. Miller
B&S 18"x10". #4 Gear Cutter
DIAMOND M. D. Horiz. Surf. Grinder
GOULD & EBERHARDT Rotary Milling Mach.
BIGNALL-KEELER 12" M.D. Pipe Machine

Write Us For Any Other Tools You May Want
Let Us Quote On All Machinery Needs

McDONALD MACHINERY CO.

1531-35 N. Broadway St. Louis, Mo.

3-B Milwaukee Plain Miller; double over-arm.
Taylor & Fenn Internal Grinder; like Heald No. 70.
3' American Radial Drill; gear box drive.
No. 2 Baker Keyseater, MD; 2" capacity.
No. 12 Brown & Sharpe Production Mill; 26" longitudinal power feed; power fast travel.
Cutting-off machines, MD; 2" bars; 3" tubing.
No. 1½ Bliss Gap-Frame, Single-Crank Toggle Drawing Press. Motor-Driven; 8" stroke; nice condition.
Type B—No. 6 Murchey Die Head 3 to 4" capacity.
Armstrong Tool Holders—1¼ x 2¼ x 13; ¾" bit.

A. R. MARSH MACHINERY CO.

4900 West 73rd Street CLEVELAND, O.

MISCELLANEOUS MACHINES

30x30x12' Gray Spur Grd. Planer, m.d.
12x18" Cinci. Plunge Cut Grinder, m.d. with 9" face wheel, and oscil. att.
3' Carlton Sensi. Radial, with tapping att.
6' Niles Plain Radial Drill
4-spindle Henry & Wright High Speed Drill
Gisholt Tool Grinder, arr. for m.d.
10"x10" Napier Metal Band Saw
⅜" Shuster Wire Straightener & Cut-off Machine
½" Shuster Wire Straightened & Cut-off Machine

STRONG, CARLISLE & HAMMOND COMPANY

1392 West 3d St. Cleveland, Ohio — **2832 E. Grand Blvd. Detroit, Mich.**

Cincinnati No. 5 Plain Miller S.P.D.

GRINDERS

Landis 12x36", 16x5, self-Cont., M.D.
Modern 10x24", 14x42", M.D., Norton 16x50"
Pratt & Whitney 14", B.B. M.D.
Norton 50"x28' Roll, M.D.
Heald No. 55, 60.

LARGE LATHES

48"x26' Miles Lathe.
48"x12' Harrington Gap. sld. bed.
26"x13' Boye & Emmes
26"x14' Rahn-Larmon raising blocks to 34"
24"x14' Rahn-Larmon

AARON MACHINERY CO.
45 CROSBY STREET NEW YORK, N.Y.

BORING MILL, Horiz. 4¼" bar Table Type.
GEAR PLANERS, Bevel, 36" & 54" Gleson, M.D.
GRINDER, 18' x 30' x 96' Norton C 1., M.D.
PRESS, Dbl. Crk. 95-B Toledo, Dbl. Geared.
PRESS, Toggle No. 14 Bliss, stroke 18".
PRESS, Hydr., 1000 ton Wood, platen 42" x 9'.
SLOTTER, 48" Morton, Portable, M.D.
STRAIGHTENER, Tube Torrington, cap. ¼"-⅝".

LANG MACHINERY COMPANY

28th St. & A. V. R. R. Pittsburgh, Pa.

500# B&S Board Drop Hammer.
1000# & 2000# Steam Forging Hammers.
#14 Cochrane-Bly Vert. Miller & Shaper, M.D.
50" G & E Gear Cutter.
#55 Heald Internal Grinder.
10' Bridgeport Knife Grinder.
20"-24" G & E Shapers.
36" Morton Draw Cut Shaper.
No. 2 Baker Keyseater, 2"x20".

WEST PENN MACHINERY COMPANY

1210 House Bldg. Pittsburgh, Pa.

New "SEARCHLIGHT" Advertisements

Received by 10 A. M. Monday will appear in the issue out Thursday of the following week, subject to limitations of space available.

Departmental Staff
AMERICAN MACHINIST
330 W. 42nd St., New York

MOREY
DEPENDABLE USED MACHINES

La POINTE No. 2 Two Spindle Broach

G & E 48" Gear Cutter

GLEASON 10" Spiral Bevel Gear Gen.

GLEASON 6"-18" Bevel Gear Gen.

HEALD No. 70A Duplex Internal Grinder

HEALD No. 60 Internal Grinder

INGERSOLL 24" Cutter Grinder

LANDIS No. 3½ Int. Hyd. Race Grinder

AUTOMATIC MACHINE CO. 12"x4' Quick Return Taper and Relieving Type Lathe for manufacturing taps

100 Assorted Milling Machine Attachments

DIVIDING HEADS

Vertical-Slotting—Rack Cutting

For BROWN & SHARPE—CINCINNATI — KEARNEY & TRECKER — Le BLOND — HENDY — OHIO — ROCKFORD — KEMPSMITH

For Immediate Delivery:

3—New FRAY
ALL ANGLE MILLING ATTACHMENTS
Style "C"—Back Geared, Motor Drive, 3 phase, 60 cycle, 220 Volt

P. & W. No. 12 Multi-Spindle Drill

NATCO C-13 Hyd. Multiple Spindle Drill

ESPEN LUCAS No. 138 Cold Saw —Cap. 12"

LANDIS 4" Single Head Bolt Threader

ACME 1" All Steel Upsetter

SAUNDERS 8"-18" Pipe Threader

TREADWELL 12" Pipe Machine

GISHOLT Precision Balancing Machine

LONG & ALSTATTER Angle Shears

THIS IS A PARTIAL LIST

• *Write us* •
your Specific Inquiries

MOREY
MACHINERY CO., Inc.
410 BROOME ST., NEW YORK

EASTERN OFFERS FROM STOCK

MULTIPLE SPINDLE DRILLS

No. 30 Natco, tapping attach., m.d.
3 spindle Rockford 12" Gang
4 spindle Harrington H.D. Rail
5 spindle Detroit Semi-Auto. Horizontal
6 spindle National Acme Horizontal
8 spindle Hammond Horizontal, m.d.
No. 008 Garvin Horizontal Duplex
No. 1 Baush, m.d. (4 in stock)
No. 1 Pratt & Whitney 2 spindle Gun Barrel
No. 2 Baush, hydraulic feed (3)
No. 2 Baush, tapping attach.
No. 2 Baush, mechanical feed
D2 Fox Straight Line
No. 3 Baush (3 in stock)
D11 Fox, 11 spindles
No. 11 Pratt & Whitney, 10 spindles
No. 22AC Fox
No. 26C Fox Tapper, 50 spindles
No. 51C Harrington, 10 spindles

RADIAL DRILLS

2½' Avey Sensitive
3' American Sensitive
3' Carlton Sensitive
3' Cincinnati Bickford Plain, gear box
4' Hammond Jack Knife, wall type
4' Hammond Jack Knife Sensitive
5' Prentice Plain, U.S. Vari-Drive

UPRIGHT DRILLS

21" Champion
22" Aurora
22" Barnes All Geared Self-Oiling
24" Aurora (3)
24" Cincinnati
24" Cincinnati Bickford
24" Hoefer
24" Milwaukee

GEAR CUTTERS & HOBBERS

16" Gould & Eberhardt Gear Cutter
No. 3—26" Cincinnati
30" Brainerd
No. 3—36" Brown & Sharpe Spur
No. 3 Heavy Brown & Sharpe Spur
No. 3—26" Brown & Sharpe Spur
No. 4—36" Brown & Sharpe Spur
No. 4—48" Brown & Sharpe Spur
No. 6—60" Brown & Sharpe Spur
No. 6—72" Brown & Sharpe Spur
18" Gleason Straight Tooth Bevel Gear Generator

GRINDERS

Cincinnati Valve Seat Grinder, m.d.
No. 50 Heald Cylinder, hydraulic feeds, m.d. (3)
No. 55, 60, 65 Heald Cylinder
10x36" Landis Integral Cam, m.d.
10x36" Norton, m.d., plain cylindrical
10x52" Landis, m.d.
10x72" Norton, m.d.
12x36" Cincinnati, belt
12x36" Modern, m.d.
12x36" Modern, belt
12x42" Landis, belt
12x48" Modern, m.d.
16x120" Landis No. 18, m.d.
26x96" Landis, m.d.
No. 20 Gardner B.B. Comb. Disc.
No. 10, 20 Bryant Internal
Walker Single Stroke Vert. Surf.
38"x38"x12' Gray Planer Type Surface, m.d.
No. 1 Fraser Lapper, 26"
14" Pratt & Whitney Vertical Surface, m.d.
54" Bridgeport Knife
Landis Chaser Grinder, belt
Gisholt Universal Tool
Gleason Cutter, belt
Gorton Cutter Grinder, m.d. in base, for end mills
Gould & Eberhardt Gear Cutter Grinder

HAMMERS

Pettengell Bumping, belt
50 lb. Bradley Upright Strap
60 lb. Bradley Rubber Cushioned Helve
No. 400 Bliss Board Drop
800 lb. Bement Single Frame Steam
1100 lb. Bement-Miles Single Frame Steam
2000 lb. Niles-Bement-Pond Single Frame Steam
2500 lb. Bement-Miles Single Frame Steam

KEYSEATERS

1" Morton
No. 4 Mitts & Merrill
Morton Keyway Cutter & Slotting Mach., 24" stroke
No. 2 Morton Keyseater, belt

Partial listing only.
Let us quote on your requirements

The
EASTERN
MACHINERY CO.
1004 TENNESSEE AVE.
CINCINNATI, OHIO

. . . IN STOCK

AUTOMATICS

⅞" Gridley Model G, four spindle
¾" Gridley Model F, four spindle
1¼" Gridley Model F, four spindle
1¾" Gridley Model F, four spindle
No. 515 National Acme, four spindle
2½" Cleveland Model A, single spindle

DRILLS

Allen, Sensitive, with tapping attachment
2½' Fosdick Radial, c.d.
6' Prentice Radial, s.p.d.
No. 15½ Foote Burt Fixed Center
No. 12 Natco Multiple Spindle
No. 37 Natco Multiple Spindle

GEAR CUTTERS

No. 3 Brown & Sharpe Automatic
No. 6—72" Brown Sharpe Automatic
No. 6 Fellows Gear Shaper
96" Gleason Gear Planer
15" Gleason Spiral Bevel Generator
No. 5A Lees-Bradner Gear Generator
No. 10 Lees-Bradner Gear Grinder
30" Rochester Gear Tooth Rounder

GRINDERS

22"x48" Pratt & Whitney Vertical Spindle Surface, Timken Bearing
30" Diamond Face, 84" Table Travel
10"x20" Landis Cylindrical hydraulic
14"x50" Norton Cylindrical
18"x96" Landis Cylindrical
No. 60 Heald Cylinder
No. 75 Heald Internal

LATHES

No. 4 Elgin Precision Bench, c.d.
9" Sundstrand Manufacturing, q.h.
18"x8' Lodge & Shipley, c.d.
24"x8' Walcott, c.d.
30" x 12' Pittsburgh, c.d.

TURRET LATHES

2A Warner & Swasey, q.h.
2B Foster, q.h.
18" Libby q.h.
20" Steinle, q.h.
4D Potter & Johnson, q.h.
No. 6A Potter & Johnson, q.h.

MILLS

No. 12 Brown & Sharpe, c.d.
No. 33 Kempsmith, c.d.
Type A Gooley & Edlund
Hendey, Lincoln Type
4" Pratt & Whitney Spline
2½" Cleveland Horizontal Boring, s.p.d.
4" Bement-Niles Horizontal Boring
4½"x12" Pratt & Whitney Thread Mill
6"x48" Pratt & Whitney Thread Mill

PLANERS AND SHAPERS

38" x 38" x 12' Niles Double End Planer, r heads
20" Smith & Mills Shaper, c.d.

SAWS

6"x6" Peerless Universal Shaping, m.d.
9" x 9" Hack, m.d.
No. 12 Higley Cold Cut, 16" blade

Restore your worn machines to their original accuracy by having us rebuild them!

We have a complete rebuilding department operated by men thoroughly trained in rebuilding. Your machines are taken down, carefully checked for wear, and worn parts are replaced, bearings and ways scraped and refitted. You'll find when rebuilt by us they'll perform like they did when they were new

Write, wire or phone us.

INDIANAPOLIS MACHINERY & SUPPLY CO., INC.
1959-69 South Meridian Street
INDIANAPOLIS, INDIANA
Eastern Branch:
44 WHITEHALL STREET, NEW YORK, N. Y.

GUARANTEED USED MACHINE TOOLS

DRILLS

4 spdl. Sigourney (4)

4 spdl. Henry & Wright (19)

MILLERS

26" x 36" x 10' Ingersoll

26" x 25" x 12' Ingersoll

GEAR CUTTERS

No. 60BM Gould & Eberhardt Bevel Gear Rougher (2)

GRINDERS

(See page 347, Hill-Clarke Cylindrical grinders)

No. 40 Bryant Plunge Cut, Wide Wheel, Oscillating

No. 10 Lees-Bradner Spur Gear Grinder

1½" dia. New Yankee Drill Grinder

TURRET LATHES

18" Libby

HILL-CLARKE MACHINERY CO.
649 Washington Boulevard
Chicago, Illinois

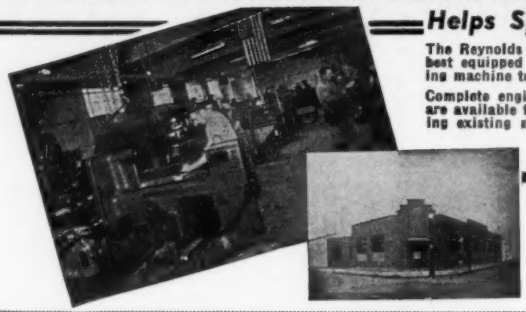
OTT MACHINERY SPECIALS

AUTOMATICS, Gridley, 2¼, 3¼, 4¼ & 5½" S.S.
AUTOMATICS, Gridley, 1¼ & 2⅝" Model F.
AUTOMATICS, Cleveland, 2" 18" feed Model B
AUTOMATICS, Cleveland, ⅞ & 2⅝" Model M
AUTOMATICS, Cone, 2½" 4 spdle, M.D.
AUTOMATICS, #22, 23 & 24 New Britain
AUTOMATICS, Potter & Johnston #5A & 6A
GRINDERS, Norton, 14x36" Plain, M.D.
GRINDERS, Cincinnati #2 Universal
LATHE, Putnam, 60"x17' with 12" Riser Blocks, total swing 85" M.D.
LATHE, 3x36" J.&L. Dble Spdle.
LATHE, Sundstrand, 8" Stub, M.D.
MILLING MACHINE #3½ Pratt & Whitney Duplex, M.D.
MILLING MACHINES, Craftsman #1 & 2
PLANER, Gray, 42"x42"x12', 3 Heads, M.D.
PLANERS, 36x36"x10' Hamilton 2 Heads, M.D.
PLANERS, 42x42"x12' Ohio, 1 Head, M.D.
PRESSES, Toledo, #34 Solid Back, S.G.
PRESSES, Toledo, # 2 to 5 Open Back Inclinable
PRESSES, Ferracute, P2, 3 & 4, Solid Back

OTT MACHINERY SALES, INC.
542 Second Ave. Detroit, Mich.

REYNOLDS MACHINE TOOL REBUILDING . . .

Helps Speed War Production



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Complete engineering and manufacturing facilities are available for modernizing, motorizing and placing existing machine tools in condition for maximum production demands and highest accuracy.

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10' NILES VERT. BORING MILL

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1—3 Ton **Shaw Traveling Crane**, 46' 4½" Span, can be put back to its original span of 46' 7". 3 Motor type, 220 volts 3-phase, 60 cycle. Cage operated, double webb box girders, 20' lift. Hoist Motor 5 HP, Bridge Motor 5 HP, Trolley Motor 1½ HP. Serial No. 3563. Original capacity 1 Ton—rebuilt by us for 3 Ton.

Will consider fair offer.

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Telephones ASTORIA 8-8408, 8409

FOR SALE

1 #3 Double LaPointe Broacher.
1 Tinuis Olsen Testing Machine, 50,000 lbs. capacity. Both machines in excellent condition.

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2 Wooster St. New York City

FOR SALE

One 8" Bignall & Keeler pipe- threading machine with cut off attachment, in fine condition, some chasers. Price $1000.00 F.O.B. Tacoma, Wash. One 4" machine, same type, same condition $500.00 F.O.B. Tacoma, Wash.

PRECISION MACHINE WORKS
TACOMA, WASH.

SEARCHLIGHT SECTION

. . . . *(Classified Advertising)* . . . .

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NEW ADVERTISEMENTS received by March 22nd will appear in the April 1st issue, subject to limitation of space available.

YOU CAN NOW HAVE YOUR NORTON GRINDERS MODERNIZED AND MOTORIZED

WE ARE IN A POSITION TO TAKE ON A LIMITED NUMBER OF THESE AT THE PRESENT TIME

SEE GRINDER AD ON PAGE 347

HILL-CLARKE MACHINERY CO., CHICAGO, ILL.

Phone: Haymarket 7660 **Cable Address: "Remand"** **651 Washington Blvd.**

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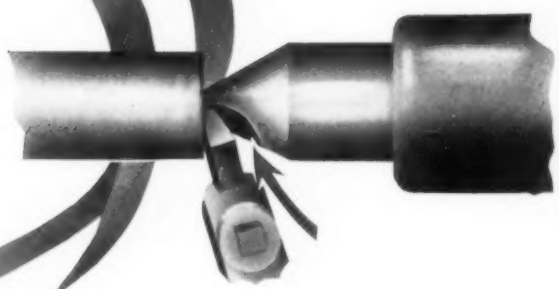
I'm tellin' you··

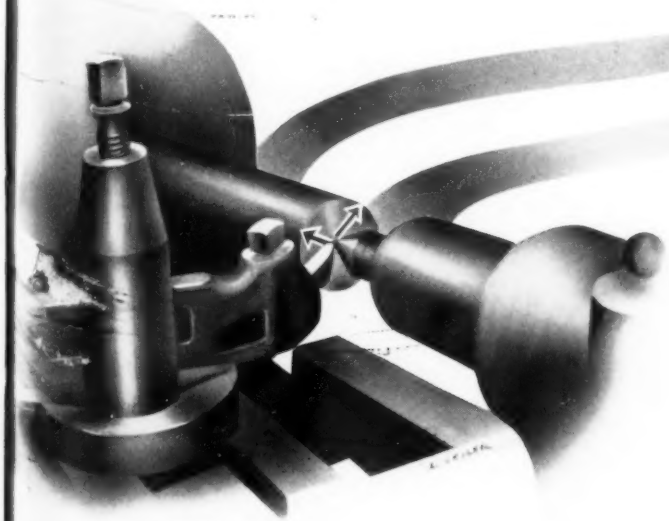
No. 8 in a Series of Tips on "Keeping 'em Turning" by Frank Morris, 42 yrs. at LeBlond

FACING TO LENGTH

Since facing is one of the most common lathe operations, most lathe hands figure they know all there is to know about it. It's not particularly difficult, but I've seen some good men go wrong on these points.

1. You'll save lots of time and effort if you'll keep handy an extra tailstock center that has been grooved or flat ground on the taper. This makes special tools unnecessary because it leaves room for a standard shape tool between work and center. Caution: Be sure flat surface is less than half way through point or it will act as a reamer.





2. For the finishing skim cut, *work from the inside out.* In other words, you start with tool point at the center hole and cut toward outside diameter of the piece with tool edge at slight angle with end of work.

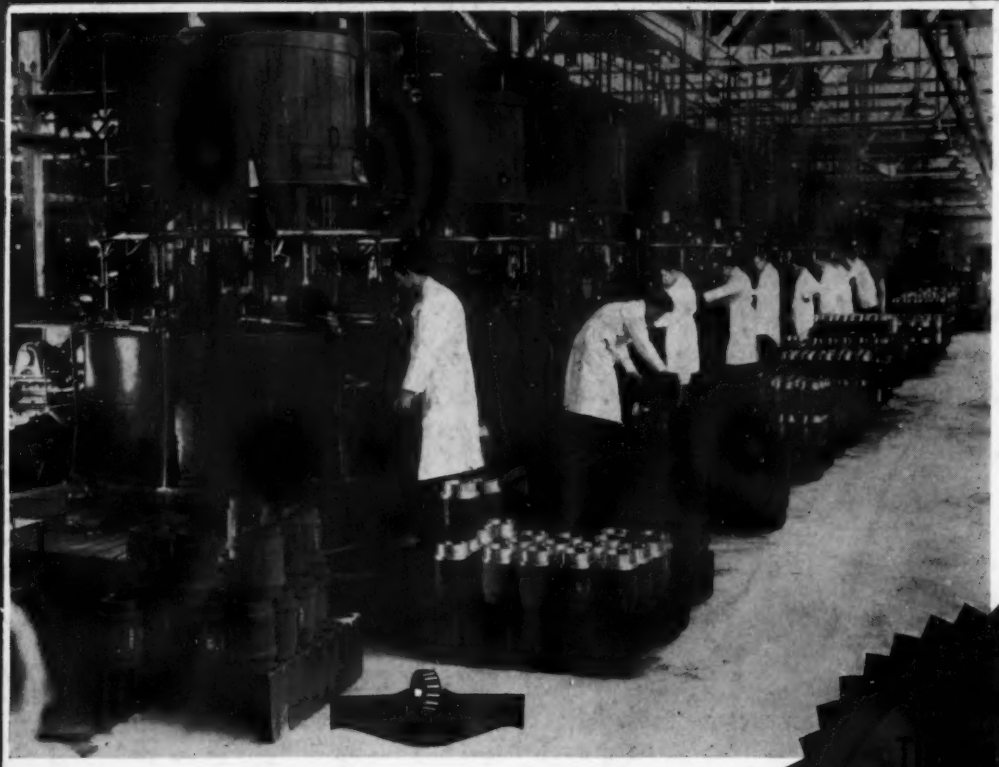
3. Should chatter marks appear on the work, it is because work is running too fast, feed is too great, or angle of tool is too slight. All of these are easily corrected.

ARMY E NAVY

THE R. K. LeBLOND MACHINE TOOL CO.

CINCINNATI, OHIO

Largest Manufacturer of a Complete Line of Lathes



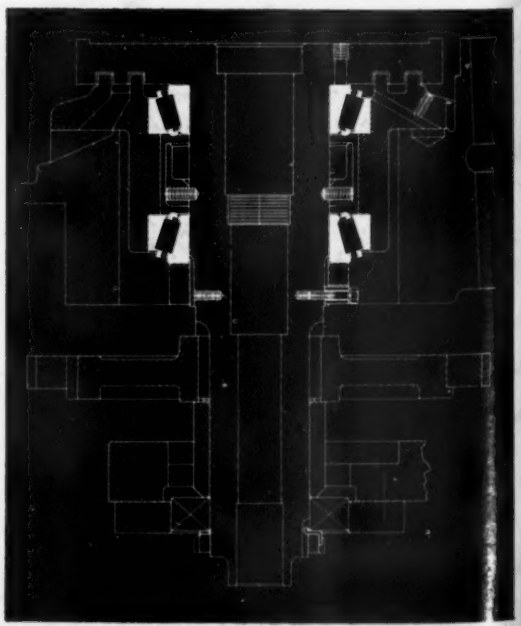
Bullard Mult-Au-Matics equipped with Timken Bearings on all spindles machining airplane engine parts.

There is a limit to the number of machine and man hours that can be crowded into a given period, but production still can be increased by giving every machine greater capacity for work with fewer possibilities for rejected parts.

The use of Timken Tapered Roller Bearings at every suitable position in your machines will help to accomplish both of these results, for then maximum protection will be assured against friction; wear; radial, thrust and combined loads; and misalignment of moving parts.

Companies whose engineers know and make full use of Timken Bearing advantages are fortunate, because they get not only machines that *perform better*, but also *sell better*—for no name in bearings means as much as "TIMKEN" to machine buyers everywhere. The Timken Roller Bearing Company, Canton, Ohio.

Application of Timken Bearings on the spindles of Bullard 8" and 12" 8-spindle Mult-Au-Matics.



The One Test For Every Decision—
Will It Help To Win The War?

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

"All There Is In Bearings"